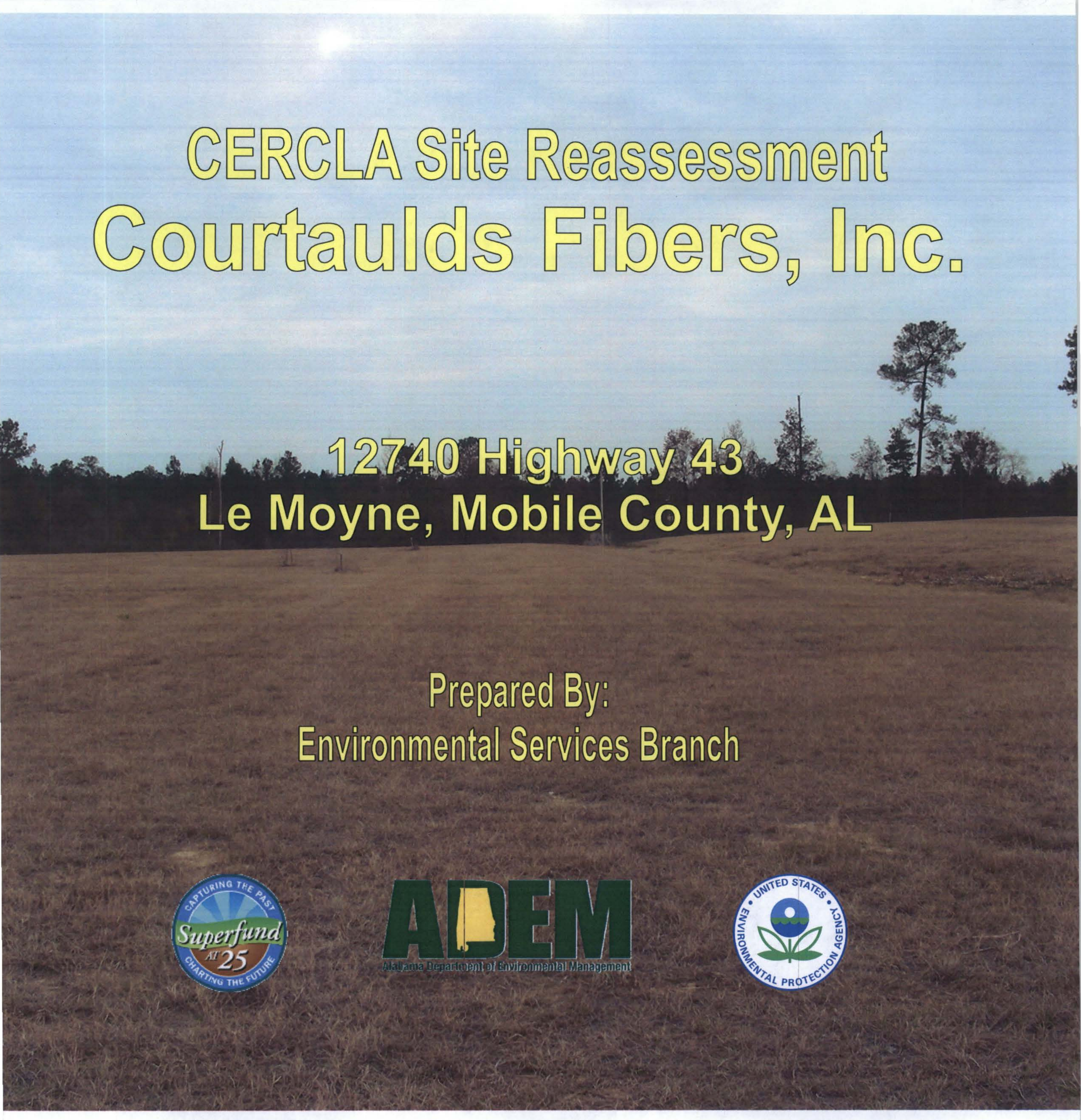

CERCLA Site Reassessment
Courtaulds Fibers, Inc.

12740 Highway 43
Le Moyne, Mobile County, AL

Prepared By:
Environmental Services Branch

TABLE OF CONTENTS

List of Figures

List of References

List of Attachments

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

CERCLA Reassessment
Courtaulds Fibers, Inc. Site
Mobile County, Alabama

1. INTRODUCTION

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Superfund Amendments and Reauthorization Act of 1986 (SARA), and a cooperative agreement between the United States Environmental Protection Agency (EPA) and the Alabama Department of Environmental Management (ADEM), a Reassessment was conducted at Courtaulds Fibers, Inc. (the Site) in Le Moyne, Mobile County, Alabama. The assessment was to collect information concerning conditions at the Site sufficient to assess the threat posed to human health and the environment and determine the need for additional investigation under CERCLA. The investigation included a review of available file information, a comprehensive target survey, and off-site/on-site reconnaissance.

2. SITE DESCRIPTION AND OPERATIONAL HISTORY

2.1 Location

The Site is at 12740 U.S. Highway 43 in Le Moyne, Mobile County, Alabama. The geographic coordinates of the Site are 30°57'40.00" north latitude and 88°0'50.00" west longitude (Attachment 1). The facility is about 2.3 miles northeast of the community of Axis, Alabama (Figure 1).

The climate of Mobile County is characterized as temperate with hot summers, mild winters, and precipitation during all months of the year. The average annual rainfall for Mobile, Alabama is 61.89 inches, with a 24-hour maximum of 7.30 inches. The 2-year, 24-hour rainfall for this region of Alabama is 5.0 inches. The average annual temperature is 67.9°F, with an average summer temperature of 81.8°F and average winter temperature of 53.4°F (References 1, 2).

2.2 Site Description

The Site is on about 665 acres in a rural/industrial area of north Mobile County, and is bounded on the north by Akzo Nobel (formerly the Stauffer Chemical Company Le Moyne plant), on the east by the Mobile River, on the south by DuPont Manufacturing, and on the west by Highway 43. A fence surrounds the perimeter of the Site, and a 24-hour guard is stationed at the entrance to the property (Att 2). A wastewater treatment plant is east of the manufacturing building. Two sludge lagoons, each about 5.3 acres in size, are directly east of the wastewater treatment plant. A limited-waste landfill is north of the sludge lagoons and a non-hazardous waste landfill is about 1,500 feet west of the Mobile River (Ref 3, Fig 2).

2.3 Operational History and Waste Characteristics

Since 1952, the Site produced synthetic fibers via the viscose rayon process. Waste from this process was composed of sludge containing cellulose, sodium sulfate, sulfuric acid, carbon disulfide, zinc sulfate, and hydrogen disulfide. The sludge was initially placed in two lagoons east of the facility and later in a landfill north of the lagoons. Under a NPDES permit, the Site also discharged various solvents, metals, and polynuclear aromatic hydrocarbons (PAHs) to the Mobile River, an unnamed tributary of Cold Creek, and an unnamed tributary of Carter Branch. According to the 1993 SI, there have been two remedial investigations (RI) conducted in the area north of the Site. The first RI was conducted at the former Stauffer facility in 1988, and contaminants associated with the viscose process used at the Courtaulds Fibers facility were detected in groundwater samples. During the second RI in 1992, mercury was detected in the investigation of Cold Creek Swamp to the north. There was no known association between mercury and the processes used at the Site; however, mercury was one of the Site's NPDES-regulated parameters and was found in on-site samples collected during the RI. When the Site was active, air monitoring showed discharges of carbon disulfate and hydrogen sulfide; these discharges originated from the spinning lines of the viscose process (Ref 3).

There are two CERCLA sites in the vicinity of the Courtaulds Fibers Site; both were previously owned and operated by the Stauffer Chemical Company. The Akzo Nobel property to the north of the Site was the former Stauffer Le Moyne Plant, which has been in operation since 1953 and manufactures various inorganic chemicals. Directly north of the Le Moyne Plant is the former Stauffer Cold Creek Plant, which began manufacturing agricultural chemicals in 1966 and is currently owned by Syngenta Crop Protection (Ref 4, Fig 3). The Stauffer sites were added to the CERCLA National Priorities List in 1983 based on data collected during a 1982 investigation by U.S. EPA and the Alabama Department of Public Health. The 1988 and 1992 RIs found that past waste disposal practices at the former Stauffer plants resulted in the contamination of soils with thiocarbamates and thiocyanate; the groundwater with carbon tetrachloride, carbon disulfide, and thiocarbamates; and Cold Creek Swamp sediments and fish species with mercury. The sites were divided into three Operable Units (OU) to manage the remediation of contaminated groundwater (OU-1), solid waste management units (OU-2), and Cold Creek Swamp (OU-3) (Ref 5). The Record of Decision (ROD) for OU-1 was issued in 1989 and detailed the modification of existing extraction and monitoring wells, as well as the expansion of extraction and monitoring systems. Groundwater extraction and monitoring activities for OU-1 are still being conducted at this time, and the Five-Year Reviews conducted in 1999 and 2005 confirmed that the activities continue to be protective of human health and the environment. The ROD for OU-2 was issued in 1995 and detailed the construction of a soil flushing system to accelerate the movement of cyanide and thiocyanate from the subsurface into the groundwater where the contaminants can be remediated by the OU-1 extraction and treatment system. In 1999, the ROD for OU-2 was expanded to include the excavation and off-site disposal of contaminated soils in the Old Neutralization Pond. The ROD for OU-3 was issued in 1993 and detailed the excavation of contaminated soil from the Transition Zone area of Cold Creek Swamp and the disposal of soil in the Upper Arm Zone. In 2008, EPA issued a Proposed Plan to amend the OU-3 ROD to include the installation of an in-situ capping technology within the Upper Arm Zone to reduce wetland destruction and prevent mobilization of sediment contamination; the amended ROD for OU-3 was finalized in 2010 (Ref 6, 7).

During the 1993 SI at the Site, surface soil, subsurface soil, sediment, and groundwater samples collected on-site contained elevated concentrations of inorganic contaminants. Contaminants associated with the viscose process (zinc, sulfide, and sulfate) were detected at elevated concentrations in six soil samples, two sediment samples, and four groundwater samples. Arsenic, copper, chromium, lead, mercury, vanadium, phthalates, Aroclor 1260, and PAHs were also detected in soil samples at elevated concentrations throughout the Site. Sediment samples collected from the sludge lagoons contained barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, and toluene. According to the 1993 SI, the areas of greatest contamination were the sludge lagoons and non-hazardous waste landfill (Ref 3).

In 1998, Akzo Nobel N.V. purchased Courtaulds Fibers Inc. and the company was split into Acordis Cellulosic Fibers Inc. and Tencel Inc., the latter of which operated on the west side of the Norfolk Southern railroad line and east of Highway 43. In 1999, CVC Capital Partners completed a buyout of Acordis and Tencel from Akzo Nobel N.V.; Acordis Cellulosic Fibers Inc. and Tencel Inc. became separate corporations, but both remained wholly-owned subsidiaries of Acordis U.S. Holding, Inc. (Ref 8). In 2001, Acordis Cellulosic Fibers Inc. ceased operations; the Tencel Inc. plant continues to operate under new ownership as Lenzing Fibers Inc (Ref 9, 10).

In 2003, the Industrial Development Authority of Mobile County assumed ownership of the Site and contracted Environmental Strategies Corporation to prepare and submit a Voluntary Cleanup Plan to ADEM for participation in the Brownfield Redevelopment and Voluntary Cleanup Program. In 2004, ADEM approved the revised Voluntary Cleanup Plan (Ref 11, 12). In the plan, three areas were identified that warranted voluntary remediation: the fuel oil tanks, above-ground diesel tanks, and the hydraulic press areas. The plan also contained a proposal to conduct soil removal and restoration of the former non-hazardous landfill, closure of the sludge lagoons and decant sump, closure of the flume tunnel and basement area, quarterly groundwater monitoring of selected wells, and the abandonment of selected groundwater monitoring and production wells (Ref 13).

In 2008, WSP Environment & Energy prepared and submitted a Risk Management Plan (RMP) for the Site. The purpose of the RMP was to identify what additional corrective actions, if any, would need to be implemented at the Site. The RMP summarizes the remedial activities that have taken place at the Site in accordance with the approved Voluntary Cleanup Plan. Potential soil source areas have been fully characterized and remediated, and ADEM has subsequently recommended No Further Action for these areas. The RMP did not evaluate the surface water pathway because groundwater monitoring of the Site indicated that groundwater contamination was not reaching the Mobile River. Groundwater monitoring at the Site began during the fourth quarter of 2004 and continued until the third quarter of 2007. During the last four groundwater sampling events, Volatile Organic Compounds (VOCs) including carbon tetrachloride, TCE, and PCE were detected in several monitoring wells along the southern property boundary at concentrations above State and Federal screening values. Because these specific compounds were not historically used in processes at the Site, it is possible that groundwater contamination may have migrated to the Site from off-site sources (Ref 9). In 2010, ADEM reviewed and approved the RMP, which had been revised to include a more detailed assessment of the former septic tank area (Ref 14).

In June 2011, Mobile County granted an environmental covenant on the property to limit future activities at the Site that might disturb contaminated areas. Under the terms of the covenant, the property was restricted to industrial use only, and the extraction/utilization of groundwater underlying the property was prohibited. The covenant restricted any activities such as grading, excavating, and mining, which would disturb the land around the sludge lagoons, non-hazardous landfill, and septic tank area (Ref 15). In July 2011, ADEM determined that the Voluntary Cleanup Plan had been successfully executed, and a Conditional Letter of Concurrence was issued for the Site (Ref 16).

3. GROUNDWATER PATHWAY

3.1 Hydrogeologic Setting

Geologic units that outcrop in Mobile County are of sedimentary origin and include deposits in the Miocene, Pliocene, Pleistocene, and Holocene Series. The units consist of materials that range from clay, silt, sand, and gravel to occasional sandstone and limestone layers.

The formations dip to the southwest towards the coast with a dip of about 40 feet per mile. Although faults and folds exist at depth in the county, no faults or folds exist near the surface at or near the Site.

The oldest unit exposed in Mobile County is the undifferentiated Miocene which is exposed in the Southern Pine Hills. The unit consists of marine and estuarine sediments of laminated to thinly-bedded clays, sands, and clayey sands. The sands range from fine to coarse-grained; generally the sediments are light colored to mottled.

The Pliocene-Pleistocene age Citronelle Formation overlies the undifferentiated Miocene in Mobile County. The Citronelle outcrops in the Southern Pine Hills caps many of the hills, ridges, and plateaus in the Pine Hills. The Citronelle Formation consists of clay, clayey sands, and sand with gravel mixed with the sands. In contrast to the underlying Miocene sediments, the Citronelle sediments generally vary in color from brown, red, to orange due to the high iron content.

Along the southern and eastern portions of Mobile County, relatively flat Pleistocene terraces occur. These terraces consist of marine, estuarine, and alluvial deposits. These terraces which are situated in the Coastal Lowlands rest on the undifferentiated Miocene sediments. The sediments found within the terraces range from very fine to coarse-grained sand, gravel, and clay; some silt occurs in these areas. The alluvial terraces in the vicinity of the site range to a depth of about 50 feet or more. The base of the deposits generally consists of coarse-grained sand with pea gravel. The upper 15 to 20 feet of the deposits consist of clay or sandy clay.

Holocene alluvium consisting of clay, silt, sand, and some gravel and organic material occurs along streams, rivers, and other drainage and water areas. Depths vary from over 100 feet in the Mobile-Tensaw Delta to a few feet in smaller drainage ways.

The Site is situated on two different Pleistocene terraces which slope to the south and east. The highest terrace is at an elevation of about 30 to 40 feet National Geodetic Vertical Datum (NGVD) and extends from the base of the Pine Hills about 2.5 miles to the west to within .75 miles from the Mobile River. The lowest terrace extends from the above terrace to the river. Elevation of the lower terrace is between 18 and 24 feet NGVD. Both terraces consist of a top stratum layer of 15 to 20 feet of clay and sandy clay which overlies substratum sand with gravel to the undifferentiated Miocene.

The major aquifers in the area are the Pliocene-Miocene aquifer and the alluvial-coastal aquifer. Although units in each aquifer are lithologically different, they are hydraulically connected. They respond to stresses as a single aquifer. Wells developed in the aquifer will yield between .5 Mgal per day to 2 Mgal per day depending on which geologic unit is developed as a source. Iron in excess of .3 mg/L occurs in areas. Generally the water is soft and low in dissolved solids.

The groundwater flow in Mobile County is generally to the south with some flow off the Pine Hills eastward towards the delta and bay.

Groundwater flow in the area of the Site is generally to the south and southeast. Surface water flow in the area of the site is similar to the groundwater flow (Ref 17).

3.2 Groundwater Targets

There are three public water wells and five industrial water wells within a 4-mile radius of the Site. The public water wells are operated by the Le Moyne Water System, Inc. (LMS) and are between three to four miles from the Site. LMS is exclusively supplied by groundwater pumped by the three wells, serving a total population of 3,360. There are no other water systems in the area that purchase drinking water from LMS. A well-head protection area for LMS is three miles southwest of the Site (Ref 18, Fig. 4).

Three industrial water wells are operated by U.S. Amines to the north and are between one to two miles from the Site. A shallow well is used by U.S. Amines to supply drinking water to about 10 workers in the front office. The other two wells are screened deeper and provide drinking and process water to the main facility and its 40 workers. Water from all three wells is sent through a treatment system prior to being used for drinking and other purposes (Ref 18).

Two industrial water wells were previously operated by Syngenta Crop Protection, Inc. to the north and are between one to two miles from the Site. The facility closed in 2010 and the wells are not currently in use (Ref 18, 19).

Private well use has been previously documented in the area; the 1993 SI reported that the nearest household with a private well was about 5,000 feet west of the sludge lagoons. The 2008 Risk Management Plan did not identify any private wells in the vicinity of the Site (Ref 3, 9).

3.3 Groundwater Conclusions

The nearest active drinking water wells are operated by U.S. Amines and are about 1.75 miles to the northwest of the Site. Public water wells operated by the Le Moyne Water System are about 3.15 miles to the southwest of the Site. Private well use has been previously documented in the area, but current use of private wells is not expected in the immediate area surrounding the Site. Groundwater contamination has been documented on-site as recently as 2007, and there is an environmental covenant restricting the use of groundwater at the Site. Remedial activities at the Stauffer Chemical sites to the north may have an effect on groundwater movement and contaminant concentrations at the Site. According to recent Five-Year Reviews conducted by EPA, groundwater extraction and treatment systems currently operating at OU-1 to the north have been effective in the protection of human health and the environment. Because groundwater flow in the area is generally to the south and east, there is minimal risk of groundwater contaminants migrating southwest towards public drinking water wells. Groundwater extraction activities at OU-1 to the north have the potential to affect groundwater movement in the area, which may represent a risk for on-site contaminants to migrate north towards industrial drinking water wells.

4. SURFACE WATER PATHWAY

4.1 Hydrologic Setting

The Site is on the surface of the Coastal Lowlands on two Pleistocene Terrace surfaces. The highest surface varies in elevation from 30 to 50 feet NGVD; the lowest surface varies in elevation from 6 to 25 feet NGVD. The Mobile River Delta is to the east and the Southern Pine Hills are to the west. The surface slopes to the east to the Mobile River and south towards Mobile. Surface water flow in the area of the Site is to the south and southeast (Ref 17).

The 1993 SI indicated that surface water runoff from the Site drains in all four directions to areas of lower elevation. According to the SI, surface water drains to the south of the Site into an unnamed intermittent creek that flows into Carter Branch. Carter Branch flows east for about three miles through an area of wetlands before converging with the Mobile River. According to the SI, surface water drains to another unnamed intermittent creek to the north of the Site. This unnamed creek flows north for about two miles to Cold Creek, which flows east through a wetland area for two miles before entering the Mobile River (Ref 3).

The probable point of entry (PPE) for the 15-mile surface water pathway is at the convergence of northern terminus of Carter Branch with a wetland area to the southeast of the Site; this represents the farthest downstream PPE. Topographical maps of the area confirm that elevation slopes to the south and east of the Site towards the Mobile River, as well as to the north towards Cold Creek (Att. 1).

4.2 Surface Water Targets

There are no public water supply intakes along the 15-mile surface water pathway (Att 1). Mobile River from its mouth to Spanish River has a use classification of Limited Warmwater Fishery. Cold Creek from the Mobile River to the Dam 1.5 miles west of U.S. Highway 43 has a use classification of Fish and Wildlife (Ref 20).

There are several threatened/endangered species in Mobile County that may be found along the 15-mile surface water pathway: Wood Stork, *Mycteria americana* (endangered); Gulf Sturgeon, *Acipenser oxyrinchus desotoi* (threatened); Alabama Red-belly Turtle, *Pseudemys alabamensis* (endangered); Eastern Indigo Snake, *Drymarchon corais couperi* (threatened); Gopher Tortoise, *Gopherus polyphemus* (threatened) (Ref 21). Along the surface water pathway are 28.29 miles of wetland frontage (Fig 5).

Mobile River at River Mile 31.0 at Bucks, Alabama has a mean annual flow rate of 24,740 cubic feet per second for Water Years 2003-2010. USGS discharge data for the Mobile River at River Mile 31.0 at Bucks, Alabama are collected from gauging station 02470629, at 31°00'56" north latitude, 88°01'15" west longitude (Ref 22). The Site is above the 500-year floodplain (Fig 6).

4.3. Surface Water Conclusions

There are no public water supply intakes along the 15-mile surface water pathway; therefore, the Site poses a minimal risk to public drinking water resources via the surface water pathway. During the 1992 RI, mercury was detected in sediments and fish tissue samples from Cold Creek Swamp to the north of the Site. Although there was no known association between mercury and the process used at the Site, mercury was one of the Site's NPDES-regulated parameters and was found in on-site samples collected during the RI. Samples collected during the 1993 SI indicated the presence of contaminants in soils, sediments, and groundwater on-site, which represents a potential for release to the surface water pathway via overland drainage. Mobile River and Cold Creek have use classifications of Limited Warmwater Fishery and Fish and Wildlife, respectively; therefore, there is a potential risk to human health through the consumption of potentially-contaminated fish.

According to the 2008 RMP, potential soil source areas were fully characterized and remediated and ADEM subsequently recommended No Further Action for the areas. An environmental covenant for the Site restricts any activities such as grading, excavating, and mining that would disturb the land around these potential soil source areas. If left undisturbed, these areas represent a minimal risk of off-site contaminant migration via surface water runoff.

5. SOIL EXPOSURE AND AIR PATHWAYS

5.1 Physical Conditions

The Natural Resources Conservation Service (NRCS) has identified three soil types in the vicinity of the Site: Izagora-Annemaine association, Izagora- Bethera association and Dorovan-Levy association soils. Izagora-Annemaine and Izagora-Bethera soils form the terrace surfaces from the Southern Pine Hills to the Mobile River. Dorovan-Levy soils form the Delta deposits along the west side of the Mobile River and in the Delta east of the Mobile River.

The terrace soils (Izagora-Annemaine and Izagora –Bethera) are moderately well drained. The soils vary from clays to silty sand. The soil pH varies from 4.5 to 5.5. The soils perk slowly and have permeabilities from 0.6 to 2.0 inches per hour.

Delta soils (Dorovan-Levy) are very poorly drained. The soils are generally clays, silts, or muck. Permeabilities are slow from .06 to 0.2 inches per hour. The soil pH varies from 3.6 to 5.5 (Ref 17).

5.2 Soil and Air Targets

The 2010 US Census states that the average household size for Mobile County is 2.61 persons per household with population density of 335.9 persons per square mile (Ref 21). The estimated total population in the 4-mile radius of the Site is 1,790 (Att 1). The population distribution is summarized in the table below:

Table 1
CERCLA Reassessment
Courtaulds Fibers, Inc. Site
Mobile County, Alabama
Demographic Data
4-mile Radius

Distance From Site (miles)	Population
0.00-0.25	0
0.25-0.50	0
0.50-1.0	8
1.0-2.0	276
2.0-3.0	843
3.0-4.0	663
Total Population	1,790

There are no schools or daycare centers within 200 feet of the Site. There are several residences on the west side of Highway 43 that are not within 200 feet of Site boundaries (Ref

24). A fence surrounds the perimeter of the Site, and a 24-hour guard is stationed at the entrance to the property (Att 2, Fig 1).

5.3 Soil Exposure and Air Pathway Conclusions

There are no schools, daycare centers, or residences with 200 feet of the Site. A fence surrounds the perimeter of the Site, and a 24-hour guard is stationed at the entrance to the property. Waste from the viscose process was composed of sludge containing cellulose, sodium sulfate, sulfuric acid, carbon disulfide, zinc sulfate, and hydrogen disulfide. The sludge was initially placed in two lagoons east of the facility and later in a landfill north of the lagoons. Sediment samples collected from the sludge lagoons during the 1993 SI indicated the presence of metal and VOC contamination. During the 1993 SI, surface and subsurface soil samples collected from several locations throughout the Site also revealed the presence of metal and organic contaminants.

In the Voluntary Cleanup Plan, three areas were identified that warranted voluntary remediation: the fuel oil tanks, above-ground diesel tanks, and the hydraulic press areas. In addition, the plan contained a proposal to conduct soil removal and restoration of the former non-hazardous landfill, closure of the sludge lagoons and decant sump, and closure of the flume tunnel and basement area. The 2008 RMP summarizes the remedial activities that have taken place at the Site in accordance with the approved Voluntary Cleanup Plan. Potential soil source areas were fully characterized and remediated, and ADEM subsequently recommended No Further Action for these areas. An environmental covenant for the Site restricts any activities such as grading, excavating, and mining that would disturb the land around these potential soil source areas. At this time, these areas represent a minimal risk of soil exposure or air pathway migration.

6. SUMMARY AND CONCLUSIONS

Since 1952, the Site operated as a synthetic fiber facility, producing synthetic fibers via the viscose rayon process. Waste from this process was composed of sludge containing cellulose, sodium sulfate, sulfuric acid, carbon disulfide, zinc sulfate, and hydrogen disulfide. The sludge was initially placed in two lagoons located east of the facility and later in a landfill north of the lagoons. Sediment samples collected from the sludge lagoons during the 1993 SI showed the presence of metal and VOC contamination. During the 1993 SI, surface and subsurface soil samples collected from several locations throughout the Site also revealed the presence of metal and organic contaminants. The 2003 Voluntary Cleanup Plan submitted to ADEM proposed to conduct soil removal and restoration in the former non-hazardous landfill and to close the sludge lagoons, decant sump, and other areas of concern. After the plan was implemented, ADEM recommended No Further Action for these areas. An environmental covenant for the Site restricts any activities such as grading, excavating, and mining that would disturb the land around these potential soil source areas. At this time, these areas represent a minimal risk for soil exposure and/or air pathway migration. If left undisturbed, these areas also represent a minimal risk of off-site contaminant migration via surface water runoff. Because there are no public water intakes along the surface water pathway, the Site poses a minimal risk to public health through drinking water resources. During the 1992 RI, mercury was detected in sediment and fish tissue samples from Cold Creek Swamp to the north of the Site. Mobile River and Cold Creek have use classifications of Limited Warmwater Fishery and Fish and Wildlife, respectively; therefore, there may be a risk to human health through consumption of potentially-contaminated fish.

The nearest active drinking water wells are operated by U.S. Amines and are about 1.75 miles to the northwest of the Site. Public water wells operated by the Le Moyne Water System are about 3.15 miles to the southwest of the Site. Private well use has been previously documented in the area, but current private well usage is not expected in the immediate area surrounding the Site. Groundwater contamination has been documented on-site as recently as 2007, and there is an environmental covenant restricting the use of groundwater at the Site. Because groundwater flow in the area is generally to the south and east, there is minimal risk of groundwater contaminants migrating southwest towards public drinking water wells. Groundwater extraction activities at OU-1 to the north have the potential to affect groundwater movement in the area, which may represent a risk for on-site contaminants to migrate north towards industrial drinking water wells.

At this time, the Site is being properly managed under ADEM's Voluntary Cleanup Program. In July 2011, ADEM determined that the requirements of Voluntary Cleanup Plan had been successfully executed, and a Conditional Letter of Concurrence was issued for the Site. At this time, ADEM recommends that No Further Action be taken at the Site under CERCLA.

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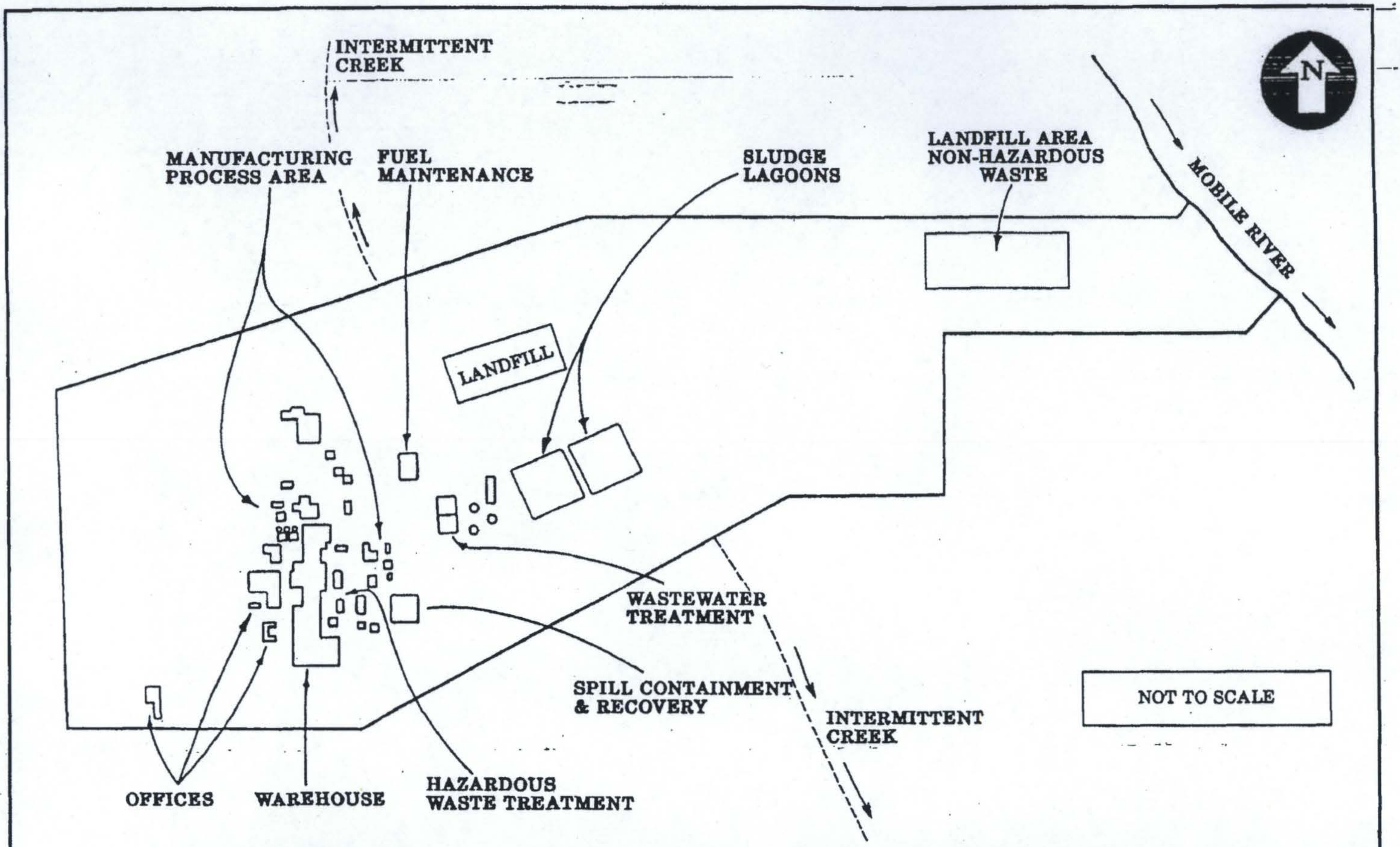
FIGURE 1


ek
Richie
http://www. eatlas.com
© 2006 Mobile Co.

FIGURE 2

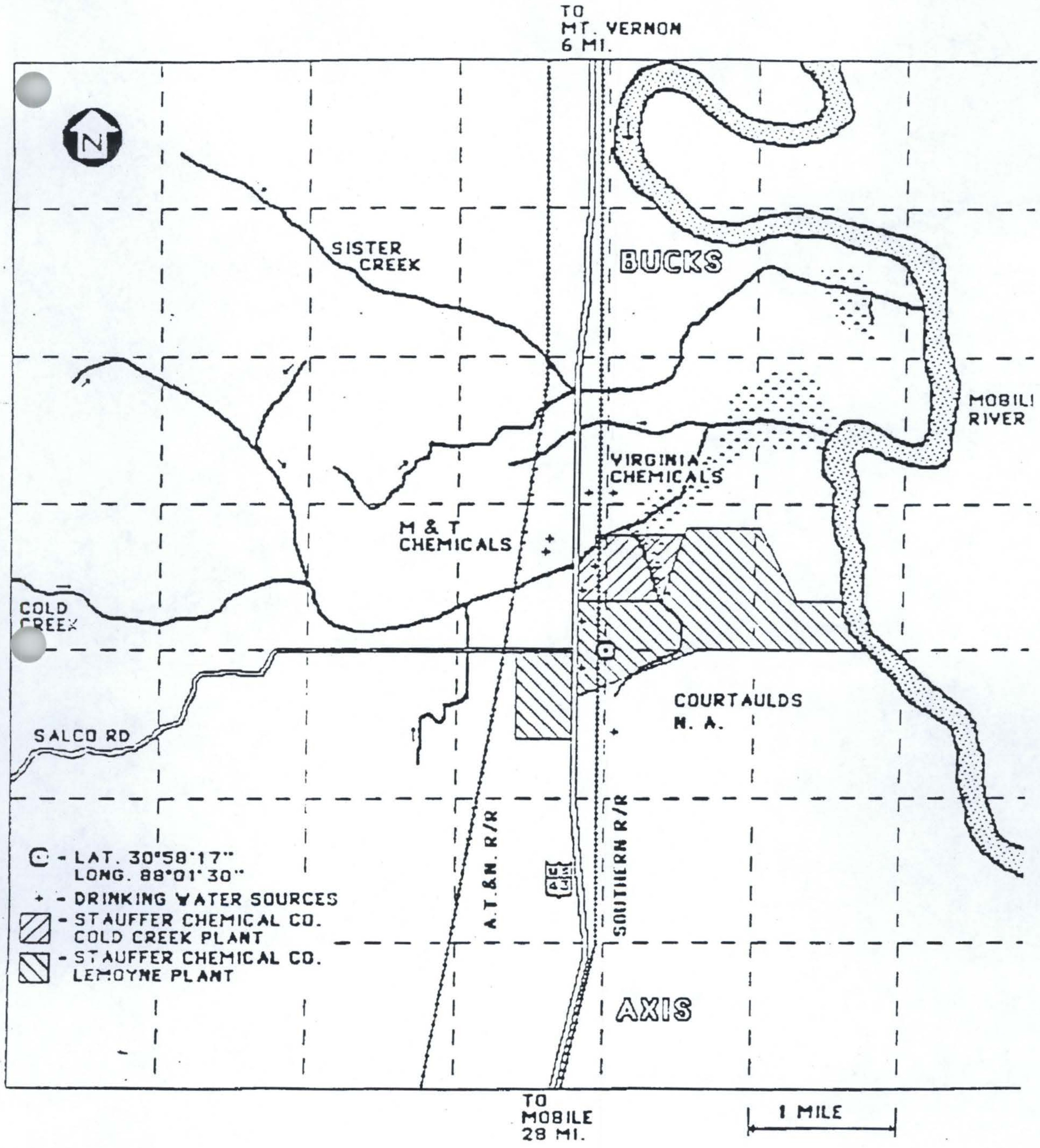


Source: Modified from Site Layout map prepared by NUS Corporation.

DYNAMAC CORPORATION
Environmental Services

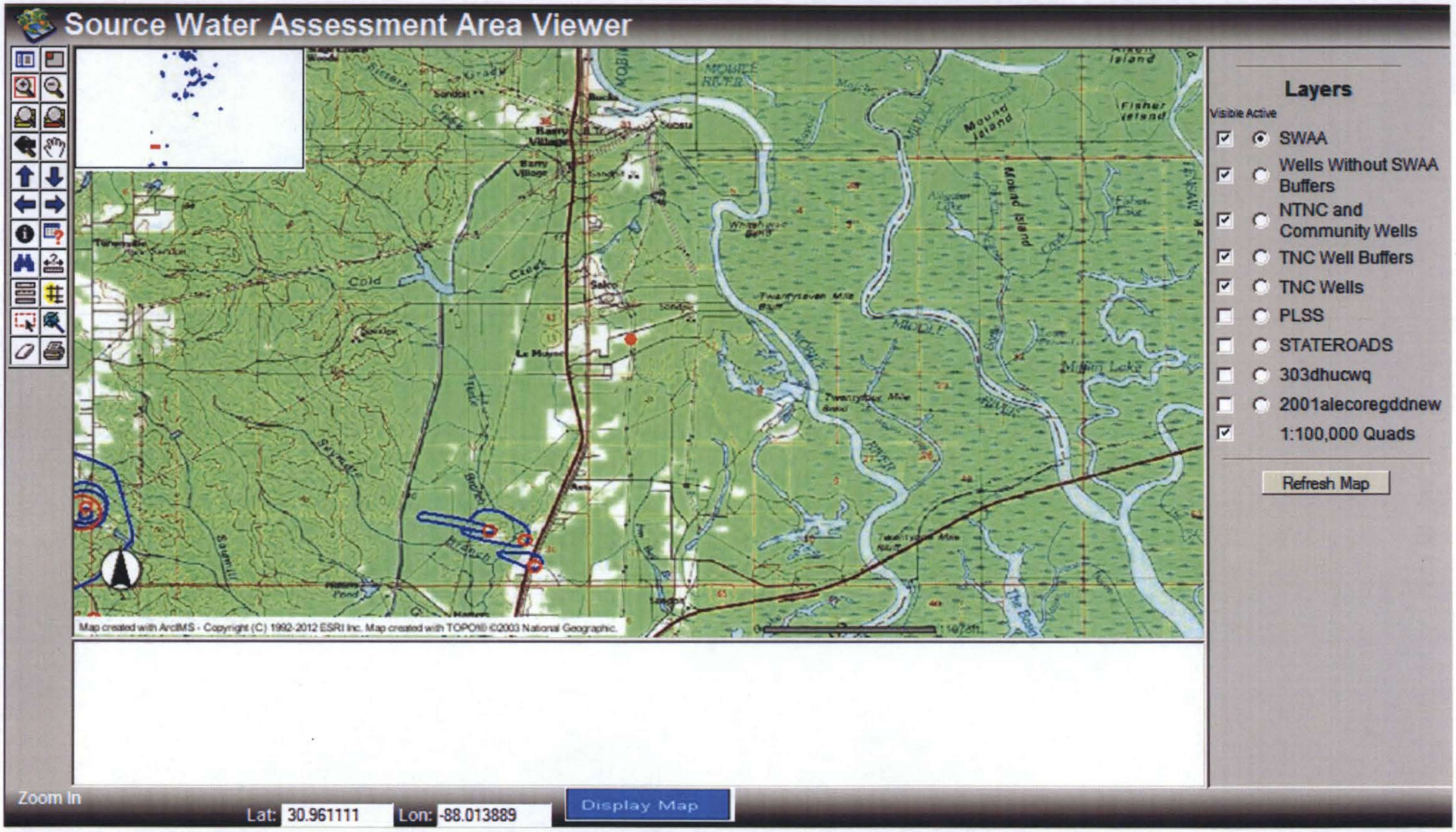
Figure 2 : Site Layout Map
COURTAULDS FIBERS, INC.
LeMoyne, Mobile County, Alabama

FIGURE 3



Approximate Location of the Cold Creek/LeMoyne Site
Mobile Co., Alabama
(Modified after Stauffer, 1987)

FIGURE 4



Source Water Assessment Area Viewer

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Layers

Visible Active

☑ ● SWAA

☑ ○ Wells Without SWAA Buffers

☑ ○ NTNC and Community Wells

☑ ○ TNC Well Buffers

☑ ○ TNC Wells

☐ ○ PLSS

☐ ○ STATEROADS

☐ ○ 303dhucwq

☐ ○ 2001alecoregddnew

☑ 1:100,000 Quads

Zoom In

Lat: 30.961111

Lon: -88.013889

FIGURE 5

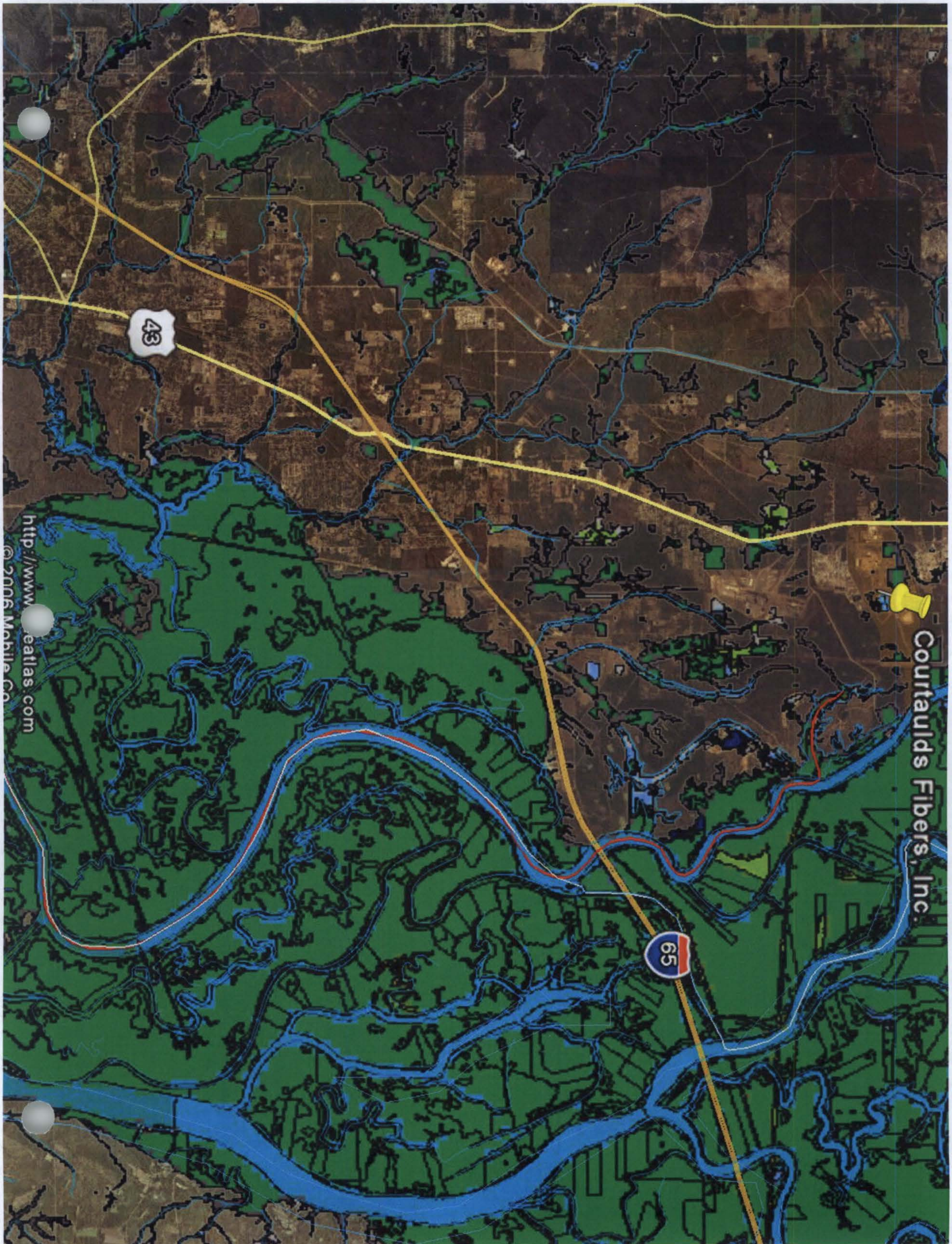
43
65
Courtaulds Fibers, Inc.
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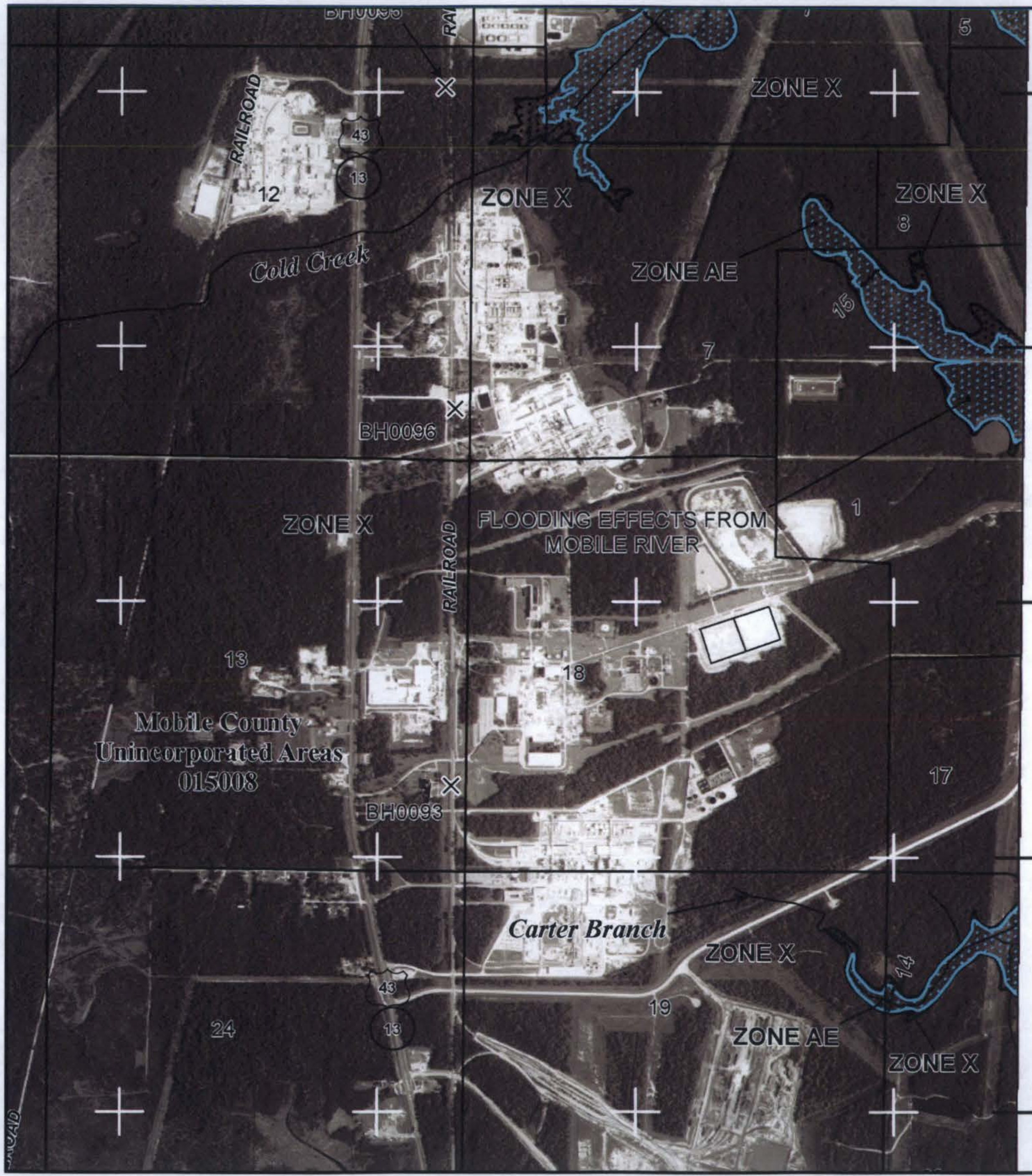
FIGURE 6



MAP SCALE 1" = 2000'

00 0 2000 4000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0325K

FIRM
FLOOD INSURANCE RATE MAP

MOBILE COUNTY, ALABAMA
AND INCORPORATED AREAS

PANEL 325 OF 1018
(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MOBILE COUNTY	015008	0325	K

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP REVISED	**MAP NUMBER**
MARCH 17, 2010	**01097C0325K**

State of Alabama
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

REFERENCE 1

MOBILE, ALABAMA

Period of Record General Climate Summary - Temperature

From Year=1930 To Year=1965

Station:(015483) MOBILE

Averages Daily Extremes

	Monthly Averages			Daily Extremes				Monthly Extremes				Max. Temp.		Min. Temp.	
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	F	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Days	# Days
January	60.9	43.5	52.2	83	11/1949	7	24/1963	65.2	50	39.6	40	0.0	0.2	5.2	0.0
February	63.6	46.0	54.8	82	28/1948	12	03/1951	63.9	32	43.9	58	0.0	0.0	2.6	0.0
March	68.4	50.9	59.7	90	30/1946	24	10/1932	67.3	45	53.1	60	0.0	0.0	0.7	0.0
April	75.9	58.8	67.3	90	29/1943	33	13/1940	71.5	54	63.4	50	0.1	0.0	0.0	0.0
May	83.4	66.6	74.9	99	31/1951	47	04/1954	78.3	33	70.7	54	3.3	0.0	0.0	0.0
June	89.0	72.6	80.8	102	20/1936	57	02/1956	83.7	52	78.1	61	14.4	0.0	0.0	0.0
July	90.4	74.3	82.3	103	11/1930	62	23/1947	85.1	62	80.5	50	19.1	0.0	0.0	0.0
August	90.7	74.1	82.4	101	05/1947	60	28/1952	86.0	51	79.6	31	20.0	0.0	0.0	0.0
September	86.5	70.2	78.4	99	11/1954	49	28/1942	82.6	33	75.7	43	9.7	0.0	0.0	0.0
October	79.2	59.9	69.6	94	08/1941	35	30/1952	75.7	41	62.7	52	0.7	0.0	0.0	0.0
November	68.6	49.7	59.2	86	03/1935	22	25/1950	64.9	31	54.2	32	0.0	0.0	1.0	0.0
December	62.1	44.5	53.3	80	10/1943	11	13/1962	61.4	33	44.9	63	0.0	0.0	3.4	0.0
Annual	76.6	59.3	67.9	103	19300711	7	19630124	69.7	49	65.7	40	67.4	0.2	12.8	0.0
Winter	62.2	44.7	53.4	83	19490111	7	19630124	60.9	32	47.4	58	0.0	0.2	11.2	0.0
Spring	75.9	58.8	67.3	99	19510531	24	19320310	71.3	55	63.6	31	3.5	0.0	0.7	0.0
Summer	90.0	73.6	81.8	103	19300711	57	19560602	83.6	51	80.3	61	53.6	0.0	0.0	0.0
Fall	78.1	59.9	69.0	99	19540911	22	19501125	72.8	31	65.1	52	10.4	0.0	1.0	0.0

Table updated on Jan 17,
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

Southeast Regional Climate Center, SERCC staff

MOBILE, ALABAMA

Period of Record General Climate Summary - Precipitation

From Year=1930 To Year=1965

Station:(015483) MOBILE

Averages Daily Extremes

	Precipitation											Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	4.74	14.59	36	1.03	54	5.26	02/1936	9	7	3	1	0.0	1.0	64
February	4.18	7.50	65	0.94	50	3.05	06/1955	9	6	3	1	0.0	1.0	58
March	6.44	14.98	46	1.34	63	6.41	05/1935	9	7	4	2	0.0	1.6	54
April	5.70	14.80	44	0.77	30	6.65	05/1957	7	6	3	2	0.0	0.0	30
May	4.38	11.41	47	0.40	62	4.71	19/1932	7	5	3	1	0.0	0.0	30
June	5.75	13.07	42	0.56	30	5.35	22/1942	10	7	4	2	0.0	0.0	30
July	8.08	18.35	49	1.13	47	5.27	16/1931	14	11	5	3	0.0	0.0	30
August	5.26	12.00	60	0.78	62	3.73	30/1950	11	8	4	2	0.0	0.0	30
September	5.46	15.20	57	0.37	63	7.30	01/1932	8	6	3	2	0.0	0.0	30
October	3.37	18.65	65	0.00	63	5.77	17/1937	5	4	2	1	0.0	0.0	30
November	3.44	12.09	48	0.12	49	4.53	07/1943	6	5	2	1	0.0	0.0	30
December	5.08	13.93	53	1.69	58	6.04	04/1955	9	7	3	2	0.0	0.0	30
Annual	61.89	84.50	47	33.49	54	7.30	19320901	105	78	38	20	0.1	1.6	54
Winter	14.01	23.60	36	7.93	57	6.04	19551204	27	20	9	5	0.1	1.0	58
Spring	16.52	35.20	47	4.41	63	6.65	19570405	23	18	10	5	0.0	1.6	54
Summer	19.09	32.65	49	7.61	30	5.35	19420622	34	26	12	6	0.0	0.0	30
Fall	12.27	24.60	57	3.17	38	7.30	19320901	20	15	7	4	0.0	0.0	30

Table updated on Jan 17,
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

REFERENCE 2

U.S. DEPARTMENT OF COMMERCE
LUTHER H. HODGES, Secretary

WEATHER BUREAU
F. W. REICHELDERFER, Chief

TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

Prepared by
DAVID M. HERSHFIELD
Cooperative Studies Section, Hydrologic Services Division

for
Engineering Division, Soil Conservation Service
U.S. Department of Agriculture

WASHINGTON, D.C.
May 1961
Repaginated and Reprinted January 1963

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PREFACE

This publication is intended as a convenient summary of empirical relationships, working guides, and maps, useful in practical problems requiring rainfall frequency data. It is an outgrowth of several previous Weather Bureau publications on this subject prepared under the direction of the author and contains an expansion and generalization of the ideas and results in earlier papers. This work has been supported and financed by the Soil Conservation Service, Department of Agriculture, to provide material for use in developing planning and design criteria for the Watershed Protection and Flood Prevention program (P.L. 566, 83d Congress and as amended).

The paper is divided into two parts. The first part presents the rainfall analyses. Included are measures of the quality of the various relationships, comparisons with previous works of a similar nature, numerical examples, discussions of the limitations of the results, transformation from point to areal frequency, and seasonal variation. The second part presents 49 rainfall frequency maps based on a comprehensive and integrated collection of up-to-date statistics, several related maps, and seasonal variation diagrams. The rainfall frequency (isopluvial) maps are for selected durations from 30 minutes to 24 hours and return periods from 1 to 100 years.

This study was prepared in the Cooperative Studies Section (Joseph L. H. Paulhus, Chief) of Hydrologic Services Division (William E. Hiatt, Chief). Coordination with the Soil Conservation Service, Department of Agriculture, was maintained through Harold O. Ogrosky, Chief, Hydrology Branch, Engineering Division. Assistance in the study was received from several people. In particular, the author wishes to acknowledge the help of William E. Miller who programmed the frequency and duration functions and supervised the processing of all the data; Normalee S. Foat who supervised the collection of the basic data; Howard Thompson who prepared the maps for analysis; Walter T. Wilson, a former colleague, who was associated with the development of a large portion of the material presented here; Max A. Kohler, A. L. Shands, and Leonard L. Weiss, of the Weather Bureau, and V. Mockus and R. G. Andrews, of the Soil Conservation Service, who reviewed the manuscript and made many helpful suggestions. Caroll W. Gardner performed the drafting.

CONTENTS

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

DAVID M. HERSHFIELD

Cooperative Studies Section, U.S. Weather Bureau, Washington, D.C.

INTRODUCTION

Historical review

Until about 1953, economic and engineering design requiring rainfall frequency data was based largely on Yarnell's paper [1] which contains a series of generalized maps for several combinations of durations and return periods. Yarnell's maps are based on data from about 200 first-order Weather Bureau stations which maintained complete recording-gage records. In 1940, about 5 years after Yarnell's paper was published, a hydrologic network of recording gages was installed to supplement both the Weather Bureau recording gages and the relatively larger number of nonrecording gages. The additional recording gages have subsequently increased the amount of short-duration data by a factor of 20.

Weather Bureau *Technical Paper No. 24*, Parts I and II [2], prepared for the Corps of Engineers in connection with their military construction program, contained the first studies covering an extended area which exploited the hydrologic network data. The results of this work showed the importance of the additional data in defining the short-duration rainfall frequency regime in the mountainous regions of the West. In many instances, the differences between *Technical Paper No. 24* and Yarnell reach a factor of three, with the former generally being larger. Relationships developed and knowledge gained from these studies in the United States were then used to prepare similar reports for the coastal regions of North Africa [3] and several Arctic regions [4] where recording-gage data were lacking.

Cooperation between the Weather Bureau and the Soil Conservation Service began in 1955 for the purpose of defining the depth-area-duration-frequency regime in the United States. *Technical Paper No. 25* [5], which was partly a by-product of previous work performed for the Corps of Engineers, was the first paper published under the sponsorship of the Soil Conservation Service. This paper contains a series of rainfall intensity-duration-frequency curves for 200 first-order Weather Bureau stations. This was followed by *Technical Paper No. 28* [6], which is an expansion of *Technical Paper No. 24* to longer return periods and durations. Next to be published were the five parts of the *Technical Paper No. 29* series [7], which cover the region east of 90° W. Included in this series are seasonal variation on a frequency basis and area-depth curves so that the point frequency values can be transformed to areal frequency. Except for the region between 90° W. and 105° W., the contiguous United States has been covered by generalized rainfall frequency studies prepared by the Weather Bureau since 1953.

General approach

The approach followed in the present study is basically that utilized in [6] and [7]. In these references, simplified duration and return-period relationships and several key maps were used to determine additional combinations of return periods and durations. In this study, four key maps provided the basic data for these two relationships which were programmed to permit digital computer computations for a 3500-point grid on each of 45 additional maps.

PART I: ANALYSES

Basic data

Types of data.—The data used in this study are divided into three categories. First, there are the recording-gage data from the long-record first-order Weather Bureau stations. There are 200 such stations with records long enough to provide adequate results within the range of return periods of this paper. These data are for the n-minute period containing the maximum rainfall. Second, there are the recording-gage data of the hydrologic network which are published for clock-hour intervals. These data were processed for the 24 consecutive clock-hour intervals containing the maximum rainfall—not calendar-day. Finally, there is the very large amount of nonrecording-gage data with observations made once daily. Use was made of these data to help define both the 24-hour rainfall regime and also the shorter duration regimes through applications of empirical relationships.

Station data.—The sources of data are indicated in table 1. The data from the 200 long-record Weather Bureau stations were used to develop most of the relationships which will be described later. Long records from more than 1600 stations were analyzed to define the relationships for the rarer frequencies (return periods), and statistics from short portions of the record from about 5000 stations were used as an aid in defining the regional pattern for the 2-year return period. Several thousand additional stations were considered but not plotted where the station density was adjudged to be adequate.

Period and length of record.—The nonrecording short-record data were compiled for the period 1938–1957 and long-record data from the earliest year available through 1957. The recording-gage data cover the period 1940–1958. Data from the long-record Weather Bureau stations were processed through 1958. No record of less than five years was used to estimate the 2-year values.

TABLE 1.—*Sources of point rainfall data*

Duration	No. of stations	Average length of record (yr.)	Reference No.
30-min. to 24-hr.	200	48	8, 9, 10
Hourly	2081	14	11, 12
Daily (recording)	1350	16	11, 12
Daily (nonrecording)	3409	15	13
Daily (nonrecording)	1426	47	13

Clock-hour vs. 60-minute and observational-day vs. 1440-minute rainfall.—In order to exploit the clock-hour and observational-day data, it was necessary to determine their relationship to the 60-minute and 1440-minute periods containing the maximum rainfall. It was found that 1.13 times a rainfall value for a particular return period based on a series of annual maximum clock-hour rainfalls was equivalent to the amount for the same return period obtained from a series of 60-minute rainfalls. By coincidence, it was found that the same factor can be used to transform observational-day amounts to corresponding 1440-minute return-period amounts. The equation, n-year 1440-minute rainfall (or 60-minute) equals 1.13 times n-year observational-day (or clock-hour) rainfall, is not built on a causal relationship. This is an average index relationship because the distributions of 60-minute and 1440-minute rainfall are very irregular or unpredictable during their respective time intervals. In addition, the annual maxima from the two series for the same year from corresponding durations do not necessarily come from the same storm. Graphical comparisons of these data are presented in figure 1, which shows very good agreement.

24 consecutive clock-hour rainfall vs. 1440-minute rainfall.—The recording-gage data were collected from published sources for the 24 consecutive clock-hours containing the maximum rainfall. Because of the arbitrary beginning and ending on the hour, a series of these data provides statistics which are slightly smaller in magnitude than those from the 1440-minute series The average bias was found to be approximately one percent. All such data in this paper have been adjusted by this factor.

Station exposure.—In refined analysis of mean annual and mean seasonal rainfall data it is necessary to evaluate station exposures by methods such as double-mass curve analysis [14]. Such methods do not appear to apply to extreme values. Except for some subjective selections (particularly for long records) of stations that have had consistent exposures, no attempt has been made to adjust rainfall values to a standard exposure. The effects of varying exposure are implicitly included in the areal sampling error and are probably averaged out in the process of smoothing the isopluvial lines.

Rain or snow.—The term rainfall has been used in reference to all durations even though some snow as well as rain is included in some of the smaller 24-hour amounts for the high-elevation stations. Comparison of arrays of all ranking snow events with those known to have only rain has shown trivial differences in the frequency relations for several high-elevation stations tested. The heavier (rarer frequency) 24-hour events and all short-duration events consist entirely of rain.

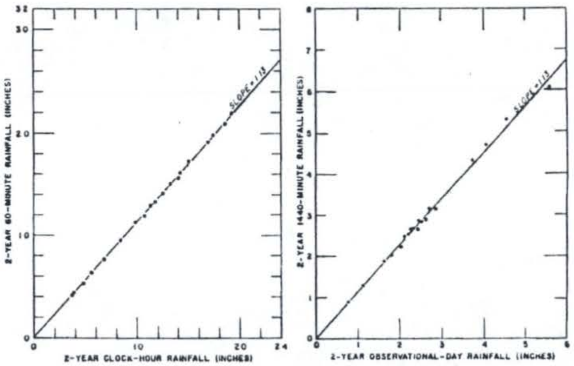

FIGURE 1.—Relation between 2-year 60-minute rainfall and 2-year clock-hour rainfall; relation between 2-year 1440-minute rainfall and 2-year observational-day rainfall.

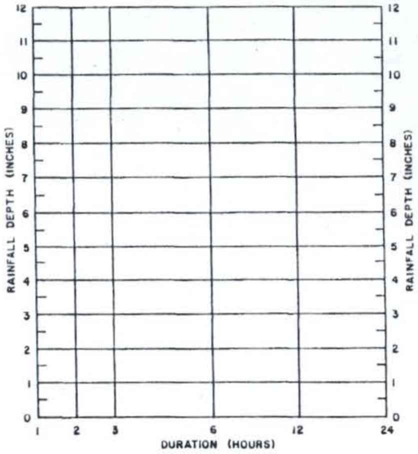

FIGURE 2.—Rainfall depth-duration diagram.

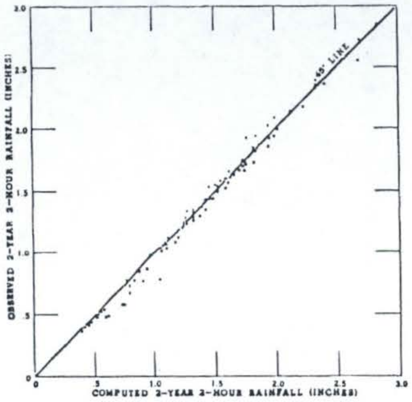

FIGURE 3.—Relation between observed 2-year 2-hour rainfall and 2-year 2-hour rainfall computed from duration diagram.

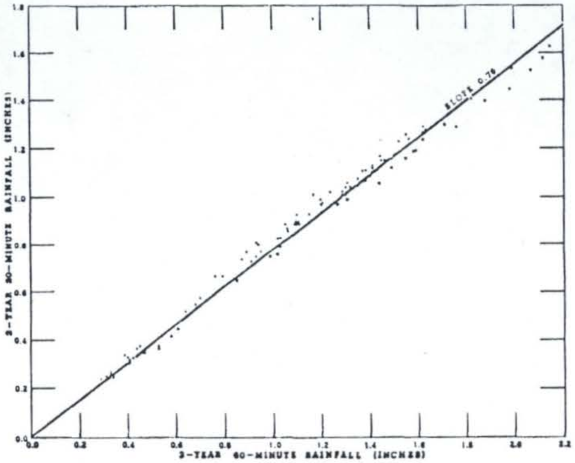

FIGURE 5.—Relation between 2-year 30-minute rainfall and 2-year 60-minute rainfall.

Duration analysis

Duration interpolation diagram.—A generalized duration relationship was developed with which the rainfall depth for a selected return period can be computed for any duration between 1 and 24 hours, when the 1- and 24-hour values for that particular return period are given (see fig. 2). This generalization was obtained empirically from data for the 200 Weather Bureau first-order stations. To use this diagram, a straightedge is laid across the values given for 1 and 24 hours and the values for other durations are read at the proper intersections. The quality of this relationship for the 2- and 6-hour durations is illustrated in figures 3 and 4 for stations with a wide range in rainfall magnitude.

Relationship between 30-minute and 60-minute rainfall.—If a 30-minute ordinate is positioned to the left of the 60-minute ordinate on the duration interpolation diagram of figure 2, acceptable estimates can be made of the 30-minute rainfall. This relationship was used in several previous studies. However, tests showed that better results can be obtained by simply multiplying the 60-minute rainfall by the average 30- to 60-minute ratio. The empirical relationship used for estimating the 30-minute rainfall is 0.79 times the 60-minute rainfall. The quality of this relationship is illustrated in figure 5.

Frequency analysis

Two types of series.—This discussion requires consideration of two methods of selecting and analyzing intense rainfall data. One method, using the partial-duration series, includes all the high values. The other uses the annual series which consists only of the highest value for each year. The highest value of record, of course, is the top value of each series, but at lower frequency levels (shorter return periods) the two series diverge. The partial-duration series, having the highest values regardless of the year in which they occur, recognizes that the second highest of some year occasionally exceeds the highest of some other year. The purposes to be served by the atlas require that the results be expressed in terms of partial-duration frequencies. In order to avoid laborious processing of partial-duration data, the annual series were collected, analyzed, and the resulting statistics transformed to partial-duration statistics.

Conversion factors for two series.—Table 2, based on a sample of a number of widely scattered Weather Bureau first-order stations, gives the empirical factors for converting the partial-duration series to the annual series.

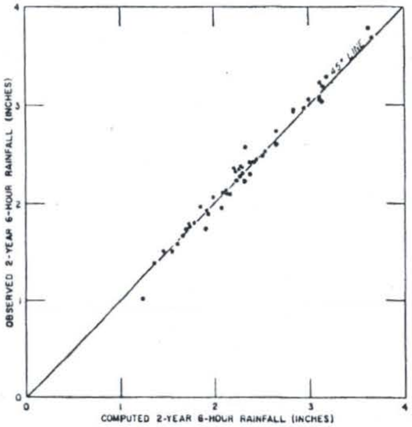

FIGURE 4.—Relation between observed 2-year 6-hour rainfall and 2-year 6-hour rainfall computed from duration diagram.

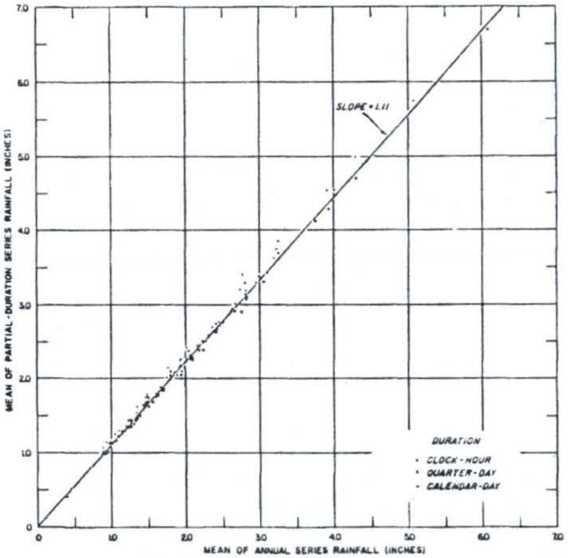

FIGURE 6.—Relation between partial-duration and annual series.

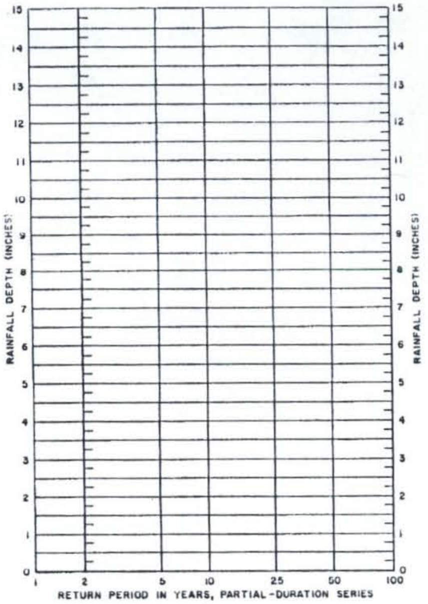

Figure 7.—Rainfall depth versus return period.

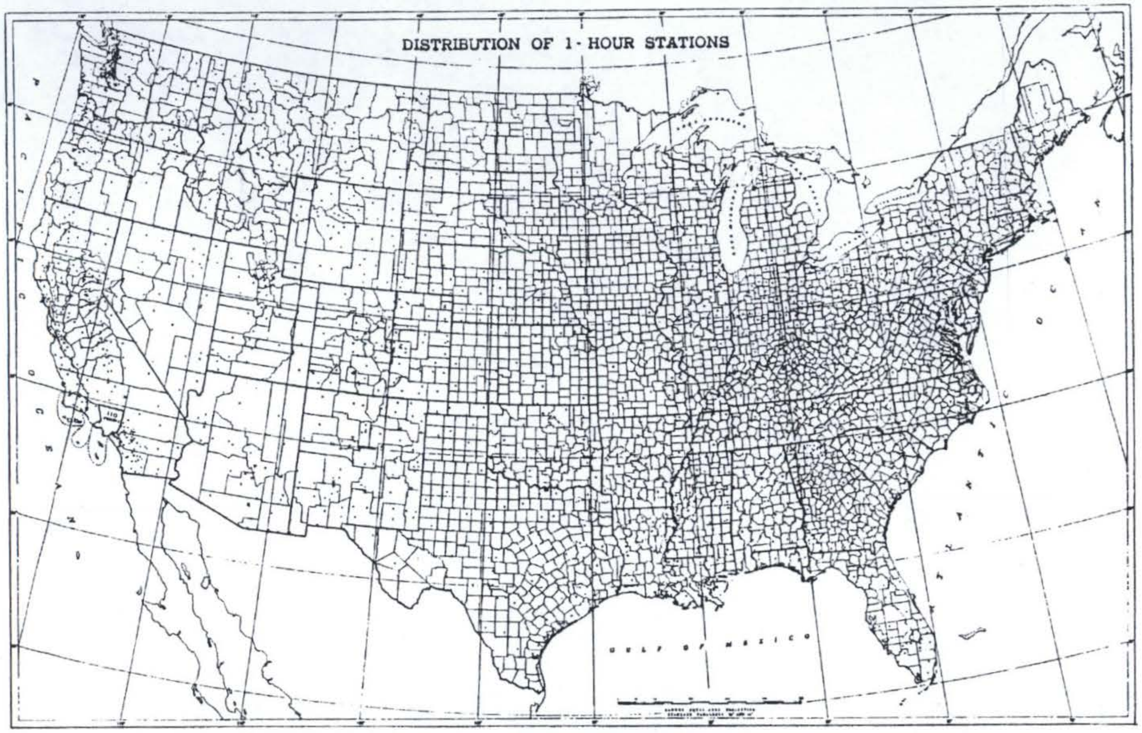

Figure 8.—Distribution of 1-hour stations.

EXAMPLE. If the 2-, 5-, and 10-year partial-duration series values estimated from the maps at a particular point are 3.00, 3.75, and 4.21 inches, respectively, what are the annual series values for corresponding return periods? Multiplying by the appropriate conversion factors of table 2 gives 2.64, 3.60, and 4.17 inches.

The quality of the relationship between the mean of the partial-duration series and the mean of the annual series data for the 1-, 6-, and 24-hour durations is illustrated in figure 6. The means for both series are equivalent to the 2.3-year return period. Tests with samples of record length from 10 to 50 years indicate that the factors of table 2 are independent of record length.

Table 2.—*Empirical factors for converting partial-duration series to annual series*

Return period	Conversion factor
2-year	0.88
5-year	0.96
10-year	0.99

Frequency considerations.—Extreme values of rainfall depth form a frequency distribution which may be defined in terms of its moments. Investigations of hundreds of rainfall distributions with lengths of record ordinarily encountered in practice (less than 50 years) indicate that these records are too short to provide reliable statistics beyond the first and second moments. The distribution must therefore be regarded as a function of the first two moments. The 2-year value is a measure of the first moment—the central tendency of the distribution. The relationship of the 2-year to the 100-year value is a measure of the second moment—the dispersion of the distribution. These two parameters, 2-year and 100-year rainfall, are used in conjunction with the return-period diagram of figure 7 for estimating values for other return periods.

Construction of return-period diagram.—The return-period diagram of figure 7 is based on data from the long-record Weather Bureau stations. The spacing of the vertical lines on the diagram is partly empirical and partly theoretical. From 1 to 10 years it is entirely empirical, based on freehand curves drawn through plottings of partial-duration series data. For the 20-year and longer return periods reliance was placed on the Gumbel procedure for fitting annual series data to the Fisher-Tippett type I distribution [15]. The transition was smoothed subjectively between 10- and 20-year return periods. If rainfall values for return periods between 2 and 100 years are taken from the return-period diagram of figure 7, converted to annual series values by applying the factors of table 2, and plotted on either Gumbel or log-normal paper, the points will very nearly approximate a straight line.

Use of diagram.—The two intercepts needed for the frequency relation in the diagram of figure 7 are the 2-year values obtained from the 2-year maps and the 100-year values from the 100-year maps. Thus, given the rainfall values for both 2- and 100-year return periods, values for other return periods are functionally related and may be determined from the frequency diagram which is entered with the 2- and 100-year values.

General applicability of return-period relationship.—Tests have shown that within the range of the data and the purpose of this paper, the return-period relationship is also independent of duration. In other words, for 30 minutes, or 24 hours, or any other duration within the scope of this report, the 2-year and 100-year values define the values for other return periods in a consistent manner. Studies have disclosed no regional pattern that would improve the return-period diagram which appears to have application over the entire United States.

Secular trend.—The use of short-record data introduces the question of possible secular trend and biased sample. Routine tests with subsamples of equal size from different periods of record for the same station showed no appreciable trend, indicating that the direct use of the relatively recent short-record data is legitimate.

Storms combined into one distribution.—The question of whether a distribution of extreme rainfall is a function of storm type (tropical or nontropical storm) has been investigated and the results presented in a recent paper [16]. It was found that no well-defined dichotomy exists between the hydrologic characteristics of hurricane or tropical storm rainfall and those of rainfall from other types of storms. The conventional procedure of analyzing the annual maxima without regard to storm type is to be preferred because it avoids nonsystematic sampling. It also eliminates having to attach a storm-type label to the rainfall, which in some cases of intermediate storm type (as when a tropical storm becomes extratropical) is arbitrary.

Predictive value of theoretical distribution.—Estimation of return periods requires an assumption concerning the parametric form of the distribution function. Since less than 10 percent of the more than 6000 stations used in this study have records for 60 years or longer, this raises the question of the predictive value of the results—particularly, for the longer return periods. As indicated previously,

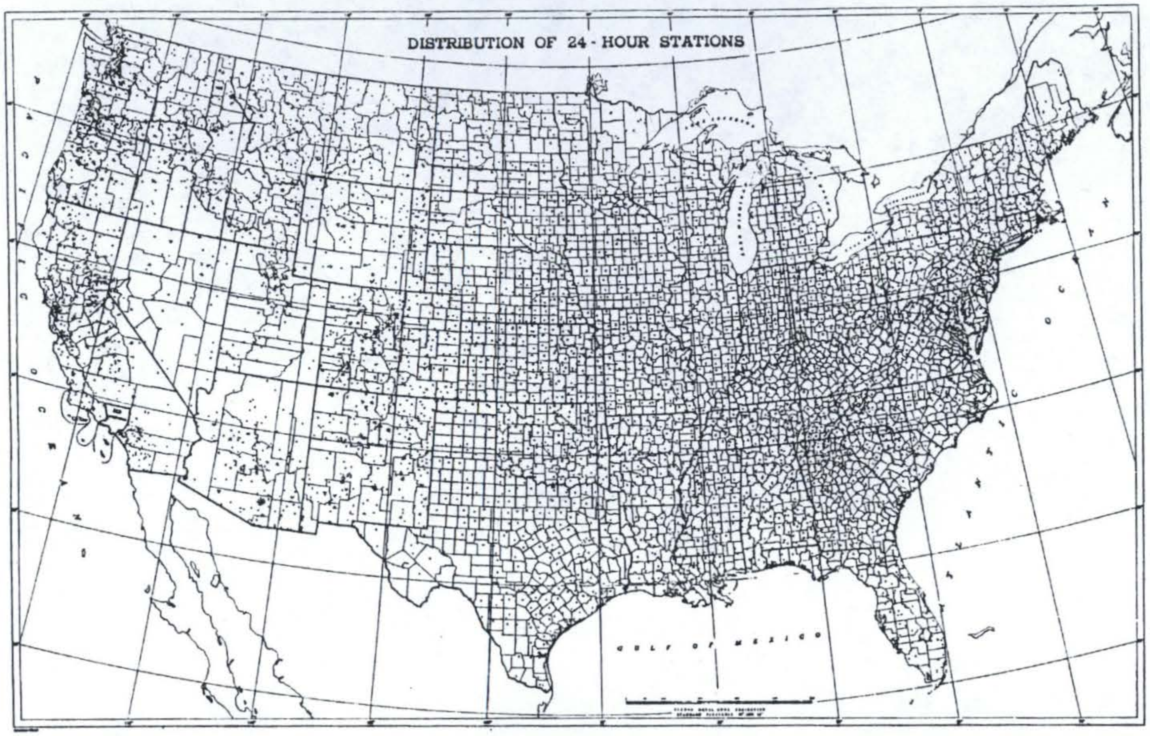

FIGURE 9.—Distribution of 24-hour stations.

reliance was placed on the Gumbel procedure for fitting data to the Fisher-Tippett type I distribution to determine the longer return periods. A recent study [17] of 60-minute data which was designed to appraise the predictive value of the Gumbel procedure provided definite evidence for its acceptability.

Isopluvial maps

Methodology.—The factors considered in the construction of the isopluvial maps were availability of data, reliability of the return period estimates, and the range of duration and return periods required for this paper. Because of the large amount of data for the 1- and 24-hour durations and the relatively small standard error associated with the estimates of the 2-year values, the 2-year 1- and 24-hour maps were constructed first. Except for the 30-minute duration, the 1- and 24-hour durations envelop the durations required for this study. The 100-year 1- and 24-hour maps were then prepared because this is the upper limit of return period. The four key maps: 2-year 1-hour, 2-year 24-hour, 100-year 1-hour, and 100-year 24-hour, provided the data to be used jointly with the duration and frequency relationships of the previous sections for obtaining values for the other 45 maps. This procedure permits variation in two directions—one for duration and the other for return period. The 49 isopluvial maps are presented in Part II as Charts 1 to 49.

Data for 2-year 1-hour map.—The dot map of figure 8 shows the location of the stations for which data were actually plotted on the map. Additional stations were considered in the analysis but not plotted in regions where the physiography could have no conceivable influence on systematic changes in the rainfall regime. All available recording-gage data with at least 5 years of record were plotted for the mountainous region west of 104° W. In all, a total of 2281 stations were used to define the 2-year 1-hour pattern of which 60 percent are for the western third of the country.

Data for 2-year 24-hour map.—Figure 9 shows the locations of the 6000 stations which provided the 24-hour data used to define the 2-year 24-hour isopluvial pattern. Use was made of most of the stations in mountainous regions including those with only 5 years of record. As indicated previously, the data have been adjusted where necessary so that they are for the 1440-minute period containing the maximum rainfall rather than observational-day.

Smoothing of 2-year 1-hour and 2-year 24-hour isopluvial lines.—The manner of construction involves the question of how much to smooth the data, and an understanding of the problem of data smoothing is necessary to the most effective use of the maps. The problem of drawing isopluvial lines through a field of data is analogous in some important respects to drawing regression lines through the data of a scatter diagram. Just as isolines can be drawn so as to fit every point on the map, an irregular regression line can be drawn to pass through every point; but the complicated pattern in each case would be unrealistic in most instances. The two qualities, smoothness and fit, are basically inconsistent in the sense that smoothness may not be improved beyond a certain point without some sacrifice of closeness of fit, and vice versa. The 2-year 1- and 24-hour maps were deliberately drawn so that the standard error of estimate (the inherent error of interpolation) was commensurate with the sampling and other errors in the data and methods of analysis.

Ratio of 100-year to 2-year 1- and 24-hour rainfall.—Two working maps were prepared showing the 100-year to 2-year ratio for the 1- and 24-hour durations. In order to minimize the exaggerated effect that an outlier (anomalous event) from a short record has on the magnitude of the 100-year value, only the data from stations with minimum record lengths of 18 years for the 1-hour and 40 years for the 24-hour were used in this analysis. As a result of the large sampling errors associated with these ratios, it is not unusual to find a station with a ratio of 2.0 located near a 3.0 ratio even in regions where orographic influences on the rainfall regime are absent. As a group, the stations' ratios mask out the station-to-station disparities and provide a more reliable indication of the direction of distribution than the individual station data. A macro-examination revealed that some systematic geographical variation was present which would justify the construction of smoothed ratio maps with a small range. The isopleth patterns constructed for the two maps are not identical but the ratios on both maps range from about 2.0 to 3.0. The average ratio is about 2.3 for the 24-hour duration and 2.2 for the 1-hour.

100-year 1-hour and 24-hour maps.—The 100-year values which were computed for 3500 selected points (fig. 10) are the product of the values from the 2-year maps and the 100-year to 2-year ratio maps. Good definition of the complexity of pattern and steepness of gradient of the 2-year 1- and 24-hour maps determined the geographically unbalanced grid density of figure 10.

45 additional maps.—The 3500-point grid of figure 10 was also used to define the isopluvial patterns of the 45 additional maps. Four values—one from each of the four key maps—were read for each grid point. Programming of the duration and return-period relationships plus the four values for each point permitted digital computer computation for the 45 additional points. The isolines were positioned by interpolation with reference to numbers at the grid points. This was necessary to maintain the internal consistency of the series of maps. Pronounced "highs" and "lows" are positioned in consistent locations on all maps. Where the 1- to 24-hour ratio for a particular area is small, the 24-hour values have the greatest influence on the pattern of the intermediate duration maps. Where the 1- to 24-hour ratio is large, the 1-hour value appears to have the most influence on the intermediate duration pattern.

Reliability of results.—The term reliability is used here in the statistical sense to refer to the degree of confidence that can be placed in the accuracy of the results. The reliability of results is influenced by sampling error in time, sampling error in space, and by the manner in which the maps were constructed. Sampling error in space is a result of the two factors: (1) the chance occurrence of an anomalous storm which has a disproportionate effect on one station's statistics but not on the statistics of a nearby station, and (2) the geographical distribution of stations. Where stations are farther apart than in the dense networks studied for this project, stations may experience rainfalls that are nonrepresentative of their vicinity, or may completely miss rainfalls that are representative. Similarly, sampling error in time results from rainfalls not occurring according to their average regime during a brief record. A brief period of record may include some nonrepresentative large storms, or may miss some important storms that occurred before or after the period of record at a given station. In evaluating the effects of areal and time sampling errors, it is pertinent to look for and to evaluate bias and dispersion. This is discussed in the following paragraphs.

Spatial sampling error.—In developing the area-depth relations, it was necessary to examine data from several dense networks. Some of these dense networks were in regions where the physiography could have little or no effect on the rainfall regime. Examination of these data showed, for example, that the standard deviation of point rainfall for the 2-year return period for a flat area of 300 square miles is about 20 percent of the mean value. Seventy 24-hour stations in Iowa, each with more than 40 years of record, provided another indication of the effect of spatial sampling error. Iowa's rainfall regime is not influenced locally by orography or bodies of water. The 2-year 24-hour isopluvials in Iowa show a range from 3.0 to 3.3 inches. The average deviation of the 70 2-year values from the smoothed isopluvials is about 0.2 inch. Since there are no assignable causes for these dispersions, they must be regarded as a residual error in sampling the relatively small amount of extreme-value data available for each station.

The geographical distribution of the stations used in the analysis is portrayed on the dot maps of figures 8 and 9. Even this relatively dense network cannot reveal very accurately the fine structure of the isopluvial pattern in the mountainous regions of the West. A measure of the sampling error is provided by a comparison of a 2-year 1-hour generalized map for Los Angeles County (4000 square miles) based on 30 stations with one based on 110 stations. The average difference for values from randomly selected points from both maps was found to be approximately 20 percent.

Sampling error in time.—Sampling error in time is present because the data at individual stations are intended to represent a mean condition that would hold over a long period of time. Daily data from 200 geographically dispersed long-record stations were analyzed for 10- and 50-year records to determine the reliability or level of confidence that should be placed on the results from the short-record data. The diagram of figure 11 shows the scatter of the means of the extreme-value distributions for the two different lengths of record. The slight bias which is exhibited is a result of the skewness of the extreme-value distribution. Accordingly, more weight was given to the longer-record stations in the construction of the isopluvials.

Isoline interval.—The isoline intervals are 0.2, 0.5, or 1.0 inch depending on the range and magnitude of the rainfall values. A uniform interval has been used on a particular map except in the two following instances: (1) a dashed intermediate line has been placed between two widely separated lines as an aid to interpolation, and (2) a larger interval was used where necessitated by a steep gradient. "Lows" that close within the boundaries of the United States have been hatched inwardly.

Maintenance of consistency.—Numerous statistical maps were made in the course of these investigations in order to maintain the internal consistency. In situations where it has been necessary to estimate hourly data from daily observations, experience has demonstrated that the ratio of 1-hour to corresponding 24-hour values for the same return period does not vary greatly over a small region. This knowledge served as a useful guide in smoothing the isopluvials. On the windward sides of high mountains in western United States, the 1- to 24-hour ratio is as low as 10 percent. In southern Arizona and some parts of midwestern United States, it is greater than 60 percent. In general, except for Arizona, the ratio is less than 40 percent west of the Continental Divide and greater than 40 percent to the east. There is a fair relationship between this ratio and the climatic factor, mean annual number of thunderstorm days. The two parameters, 2-year daily rainfall and the mean annual number of thunderstorm days, have been used jointly to provide an estimate of short-duration rainfalls [18]. A 1- to 24-hour ratio of 40 percent is approximately the average for the United States.

Examination of physiographic parameters.—Work with mean annual and mean seasonal rainfall has resulted in the derivation of empirically defined parameters relating rainfall data to the physiography of a region. Elevation, slope, orientation, distance from moisture source, and other parameters have been useful in drawing maps of mean rainfall. These and other parameters were examined in an effort to refine the maps presented here. However, tests showed that the use of these parameters would result in no improvement in the rainfall-frequency pattern because of the sampling and other error inherent in values obtained for each station.

Evaluation.—In general, the standard error of estimate ranges from a minimum of about 10 percent, where a point value can be used directly as taken from a flat region of one of the 2-year maps to 50 percent where a 100-year value of short-duration rainfall must be estimated for an appreciable area in a more rugged region.

Internal inconsistency.—On some maps the isoline interval does not reveal the fact that the magnitude does not vary linearly by interpolation. Therefore, interpolation of several combinations of durations and return periods for the point of interest might result in such inconsistencies as a 12-hour value being larger than a 24-hour value for the same return period or that a 50-year value exceeds the 100-year value for the same duration. These errors, however, are well within the acknowledged margin of error. If the reader is interested in more than one duration or return period this potential source of inconsistency can be eliminated by constructing a series of depth-duration-frequency curves by fitting smoothed curves on logarithmic paper to the values interpolated from all 49 maps. Figure 12 illustrates a set of curves for the point at 35° N., 90° W. The interpolated values for a particular duration should very nearly approximate a straight line on the return-period diagram of figure 7.

Obsolescence.—Additional stations rather than longer records will speed obsolescence and lessen the current accuracy of the maps. The comparison with Yarnell's paper [1] is a case in point. Where data for new stations are available, particularly in the mountainous regions, the isopluvial patterns of the two papers show pronounced differences. At stations which were used for both papers, even with 25 years of additional data, the differences are negligible.

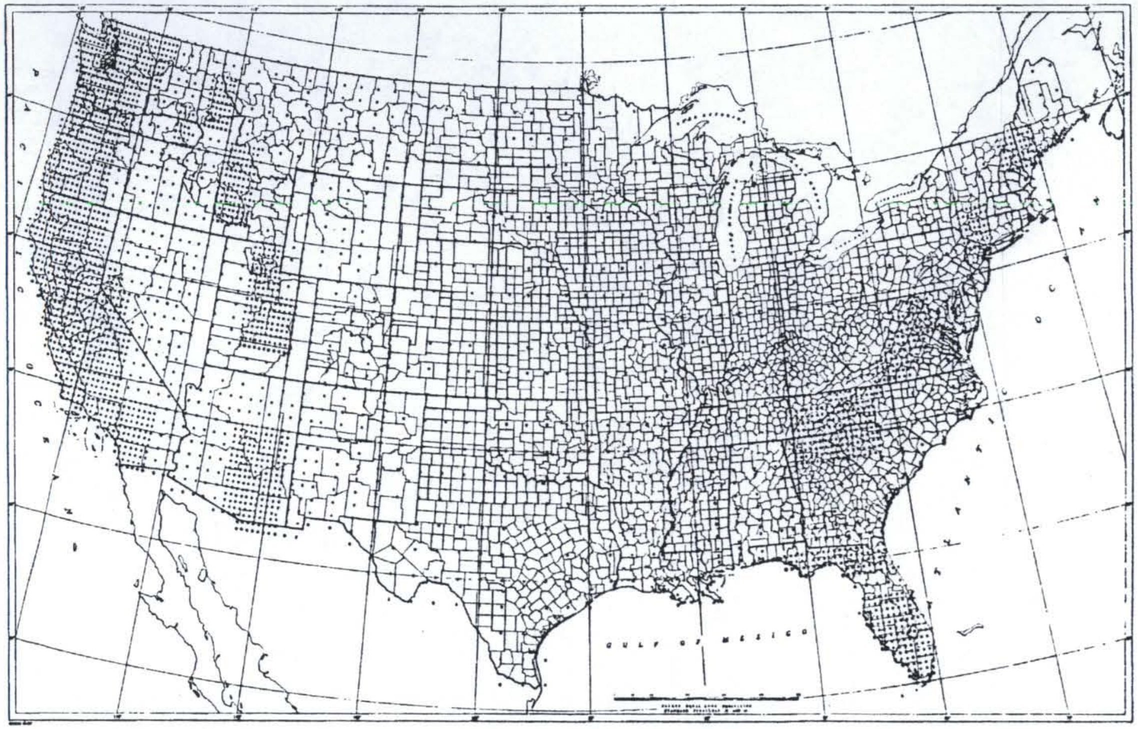

FIGURE 10.—Grid density used to construct additional maps.

Guides for estimating durations and/or return periods not presented on the maps

Intermediate durations and return periods.—In some instances, it might be required to obtain values within the range of return periods and durations presented in this paper but for which no maps have been prepared. A diagram similar to that illustrated in figure 12 can serve as a nomogram for estimating these required values.

Return periods longer than 100 years.—Values for return periods longer than 100 years can be obtained by plotting several values from 2 to 100 years from the same point on all the maps on either log-normal or extreme-value probability paper. A straight line fitted to the data and extrapolated will provide an acceptable estimate of, say, the 200-year value. It should be remembered that the values on the maps are for the partial-duration series, therefore, the 2-, 5-, and 10-year values should first be reduced by the factors of table 2.

EXAMPLE. The 200-year 1-hour value is required for the point at 35° N., 90° W. The 2-, 5-, 10-, 25-, 50-, and 100-year values are estimated from the maps to be 1.7, 2.2, 2.5, 2.9, 3.1, and 3.5 inches. After multiplying the 2-year value by 0.88, the 5-year value by 0.96, and the 10-year value by 0.99, the six values are plotted on extreme-value probability paper, a line is fitted to the data and extrapolated linearly. The 200-year value is thus estimated to be about 3.8 inches (see fig. 13).

Durations shorter than 30 minutes.—If durations shorter than 30 minutes are required, the average relationships between 30-minute rainfall on the one hand and the 5-, 10-, and 15-minute rainfall on the other can be obtained from table 3. These relationships were developed from the data of the 200 Weather Bureau first-order stations.

TABLE 3.—*Average relationship between 30-minute rainfall and shorter duration rainfall for the same return period*

Duration (min.)	5	10	15
Ratio	0.37	0.57	0.72
Average error (percent)	8	7	5

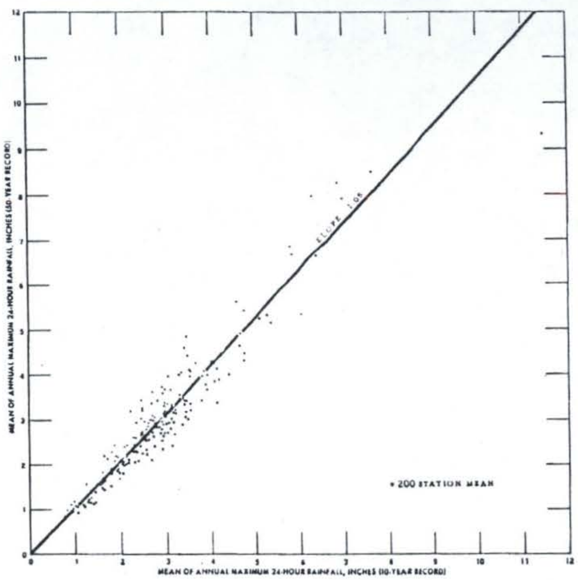

Figure 11.—Relation between means from 50-year and 10-year records (24-hour duration).

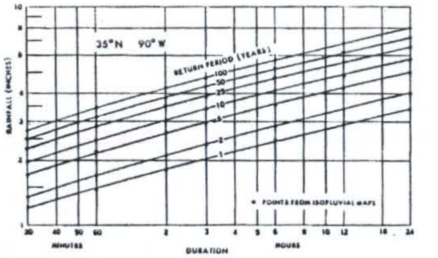

Figure 12.—Example of internal consistency check.

Comparisons with previous rainfall frequency studies

Yarnell.—A comparison of the results of this paper with those obtained by Yarnell's paper [1] brings out several interesting points. First, both papers show approximately the same values for the Weather Bureau first-order stations even though 25 years of additional data are now available. Second, even though thousands of additional stations were used in this study, the differences between the two papers in the eastern half of the country are quite small and rarely exceed 10 percent. However, in the mountainous regions of the West, the enlarged inventory of data now available has had a profound effect on the isopluvial pattern. In general, the results from this paper are larger in the West with the differences occasionally reaching a factor of three.

Technical Paper No. 25.—*Technical Paper No. 25* [5] contains a series of rainfall intensity-duration-frequency curves for the 200 Weather Bureau stations. The curves were developed from each station's data with no consideration given to anomalous events or to areal generalization. The average difference between the two papers is approximately 10 percent with no bias. After accounting for the fact that this atlas is for the partial-duration series and *Technical Paper No. 25* is for the annual series, the differences can be ascribed to the considerable areal generalization used in this paper.

Technical Paper No. 24, Parts I and II; Technical Paper No. 28.—The differences in refinement between *Technical Paper No. 24* [2] and *Technical Paper No. 28* [6] on the one hand and this paper on the other do not, however, seem to influence the end results to an important degree. Inspection of the values in several rugged areas, as well as in flat areas, reveals disparities which average about 20 percent. This is attributable to the much larger amount of data (both longer records and more stations) and the greater areal generalization used in this paper.

Technical Paper No. 29, Parts 1 through 5.—The salient feature of the comparison of *Technical Paper No. 29* [7] with this paper is the very small disparities between the four key maps and the slightly larger disparities between the intermediate maps. The average differences are of the order of magnitude of 10 and 20 percent, respectively. The larger difference between the intermediate maps is attributable to the smoothing of these maps in a consistent manner for this paper.

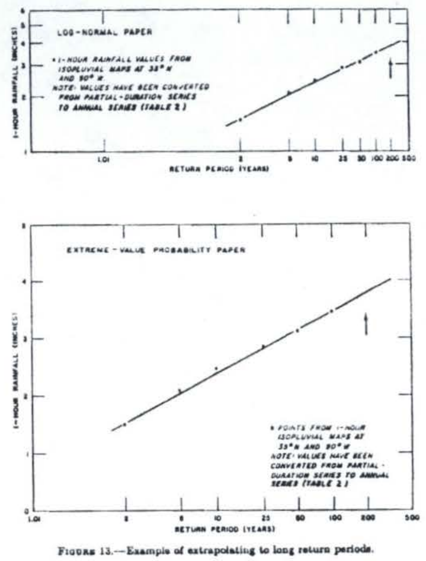

Figure 13.—Example of extrapolating to long return periods.

Probability considerations

General.—The analysis presented thus far has been mainly concerned with attaching a probability to a particular magnitude of rainfall at a particular location. Once this probability has been determined, consideration must also be given to the corollary question: What is the probability that the *n*-year event will occur at least once in the next *n* years?

From elementary probability theory it is known that there is a good chance that the *n*-year event will occur at least once before *n* years have elapsed. For example, if an event has the probability $1/n$ of occurring in a particular year (assume the annual series is being used), where n is 10 or greater, the probability, P, of the event occurring at least once among n observations (or years) is

$$P=1-(1-1/n)^n\approx 1-e^{-1}=0.63$$

Thus, for example, the probability that the 10-year event will occur at least once in the next 10 years is 0.63, or about 2 chances out of 3.

Relationship between design return period, T years, design period, T_d, and probability of not being exceeded in T_d years.—Figure 14, prepared from theoretical computations, shows the relationship between the design return period, T years, design period, T_d, and probability of not being exceeded in T_d years [19].

> EXAMPLE. What design return period should the engineer use to be approximately 90 percent certain that it will not be exceeded in the next 10 years? Entering the design period coordinate at 10 years until the 90 percent line is intersected, the design return period is estimated to be 100 years. In terms of rainfall magnitude, the 100-year value is approximately 50 percent larger than the 10-year value.

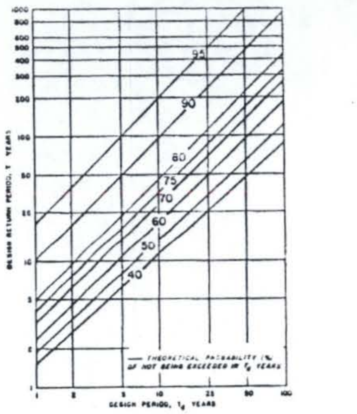

Figure 14.—Relationship between design return period, T years, design period, T_d, and probability of not being exceeded in T_d years.

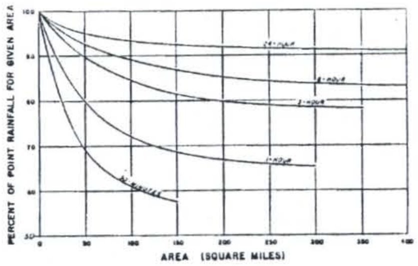

Figure 15.—Area-depth curves.

Probable maximum precipitation (PMP)

The 6-hour PMP and its relationship to the 100-year 6-hour rainfall.—Opposed to the probability method of rainfall estimation presented in this paper is the probable maximum precipitation (PMP) method which uses a combination of physical model and several estimated meteorological parameters. The main purpose of the PMP method is to provide complete-safety design criteria in cases where structure failure would be disastrous. The 6-hour PMP map of Chart 50 is based on the 10-square-mile values of *Hydrometeorological Report No. 33* [20] for the region east of 105° W. and on Weather Bureau *Technical Paper No. 38* [21] for the West. Chart 51 presents the ratios of the PMP values to the 100-year point rainfalls of this paper. Examination of this map shows that the ratios vary from less than 2 to about 9. These results must be considered merely indicative of the order of magnitude of extremely rare rainfalls.

Area-depth relationships

General.—For drainage areas larger than a few square miles consideration must be given not only to point rainfall, but to the average depth over the entire drainage area. The average area-depth relationship, as a percent of the point values, has been determined for 20 dense networks up to 400 square miles from various regions in the United States [7].

The area-depth curves of figure 15 must be viewed operationally The operation is related to the purpose and application. In application the process is to select a point value from an isopluvial map. This point value is the average depth for the location concerned, for a given frequency and duration It is a composite. The area-depth curve relates this average point value, for a given duration and frequency and within a given area, to the average depth over that area for the corresponding duration and frequency.

The data used to develop the area-depth curves of figure 15 exhibited no systematic regional pattern [7]. Duration turned out to be the major parameter. None of the dense networks had sufficient length of record to evaluate the effect of magnitude (or return period) on the area-depth relationship. For areas up to 400 square miles, it is tentatively accepted that storm magnitude (or return period) is not a parameter in the area-depth relationship. The reliability of this relationship appears to be best for the longer durations.

EXAMPLE What is the average depth of 2-year 3-hour rainfall for a 200-square-mile drainage area in the vicinity of 37° N , 86° W.? From the 2-year 3-hour map, 2.0 inches is estimated as the average depth for points in the area. However, the average 3-hour depth over the drainage area would be less than 2 0 inches for the 2-year return period Referring to figure 15, it is seen that the 3-hour curve intersects the area scale at 200 square miles at ratio 0.8. Accordingly, the 2-year 3-hour average depth over 200 square miles is 0.8 times 2 0, or 1.6 inches.

Seasonal variation

Introduction.—To this point, the frequency analysis has followed the conventional procedures of using only the annual maxima or the *n*-maximum events for *n* years of record Obviously, some months contribute more events to these series than others and, in fact, some months might not contribute at all to these two series. Seasonal variation serves the purpose of showing how often these rainfall events occur during a specific month. For example, a practical problem concerned with seasonal variation may be illustrated by the fact that the 100-year 1-hour rain may come from a summer thunderstorm, with considerable infiltration, whereas the 100-year flood may come from a lesser storm occurring on frozen or snow-covered ground in the late winter or early spring.

Seasonal probability diagrams.—A total of 24 seasonal variation diagrams is presented in Charts 52, 53, and 54 for the 1-, 6-, and 24-hour durations for 8 subregions of the United States east of 105° W. The 15 diagrams covering the region east of 90° W. are identical to those presented previously in *Technical Paper No. 29* [7]. The smoothed isopleths of a diagram for a particular duration are based on the average relationship from approximately 15 stations in each subregion. Some variation exists from station to station, suggesting a slight subregional pattern, but no attempt was made to define it because there is no conclusive method of determining whether this pattern is a climatic fact or an accident of sampling. The slight regional discontinuities between curves of adjacent subregions can be smoothed locally for all practical purposes. No seasonal variation relationships are presented for the mountainous region west of 105° W. because of the influence of local climatic and topographic conditions. This would call for seasonal distribution curves constructed from each station's data instead of average and more reliable curves based on groups of stations.

Application to areal rainfall.—The analysis of a limited amount of areal rainfall data in the same manner as the point data gave seasonal variations which exhibited no substantial difference from those of the point data. This lends some confidence in using these diagrams as a guide for small areas.

EXAMPLE. Determine the probability of occurrence of a 10-year 1-hour rainfall for the months May through August for the point at 45° N., 85° W. From Chart 52, the probabilities for each month are interpolated to be 1, 2, 4, and 2 percent, respectively. In other words, the probability of occurrence of a 10-year 1-hour rainfall in May of any particular year is 1 percent; for June, 2 percent; and so forth. (Additional examples are given in all five parts of *Technical Paper No. 29*.)

References

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2. U.S. Weather Bureau, "Rainfall Intensities for Local Drainage Design in the United States for Durations of 5 to 240 Minutes and 2-, 5-, and 10-Year Return Periods," *Technical Paper No. 24*, "Part I: West of the 115th Meridian," Washington, D.C., August 1953, 19 pp. Revised February 1955. "Part II: Between 105° W. and 115° W.," Washington, D.C., August 1954, 9 pp.
3. U.S. Weather Bureau, "Rainfall Intensities for Local Drainage Design in Coastal Regions of North Africa, Longitude 11° W. to 14° E. for Durations of 5 to 240 Minutes and 2-, 5-, and 10-Year Return Periods," Washington, D.C., September 1954, 13 pp.
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5. U.S. Weather Bureau, "Rainfall Intensity-Duration-Frequency Curves for Selected Stations in the United States, Alaska, Hawaiian Islands, and Puerto Rico," *Technical Paper No. 25*, Washington, D.C., December 1955, 53 pp.
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14 M. A. Kohler, "Double-Mass Analysis for Testing the Consistency of Records and for Making Required Adjustments," *Bulletin of the American Meteorological Society*, vol. 30, No. 5, May 1949, pp. 188–189.
15. E. J. Gumbel, *Statistics of Extremes*, Columbia University Press, 1958, 375 pp.
16. D. M. Hershfield and W T. Wilson, "A Comparison of Extreme Rainfall Depths from Tropical and Nontropical Storms," *Journal of Geophysical Research*, vol. 65, No 3, March 1960, pp. 959–982.
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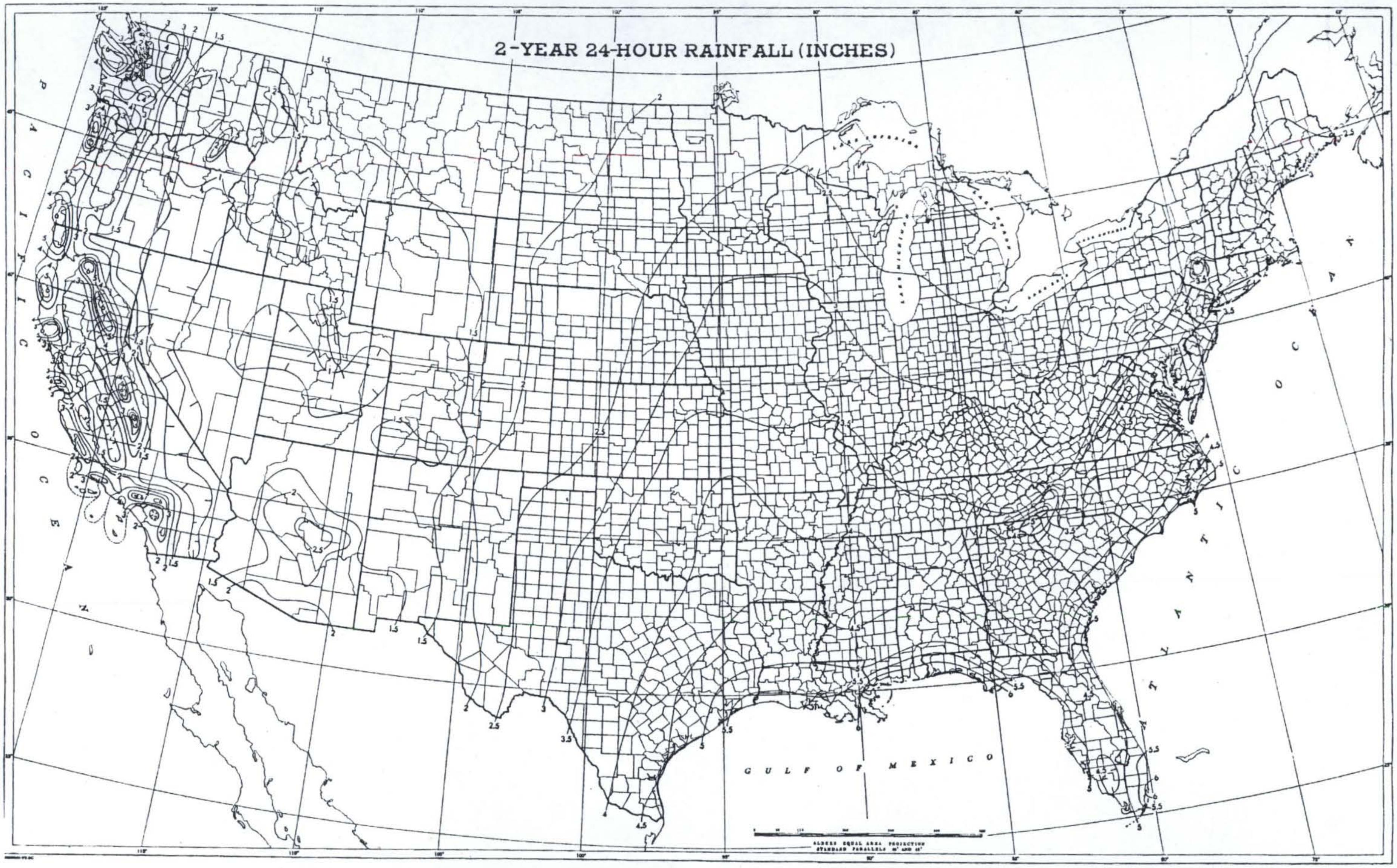
19. Arnold Court, "Some New Statistical Techniques in Geophysics," *Advances in Geophysics*, vol. I, Academic Press, New York, 1952, pp. 45–85.
20. U.S. Weather Bureau, "Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1000 Square Miles and Durations of 6, 12, 24, and 48 Hours," *Hydrometeorological Report No. 33*, April 1956, 58 pp.
21 U.S. Weather Bureau, "Generalized Estimates of Probable Maximum Precipitation for the United States West of the 105th Meridian for Areas to 400 Square Miles and Durations to 24 Hours," *Technical Paper No. 38*, 1960, 66 pp.

PART II

Charts 1–49:	Isopluvial maps.
Charts 50–51:	The 6-hour probable maximum precipitation and its relationship to the 100-year 6-hour rainfall.
Charts 52–54:	Diagrams of seasonal probability of intense rainfall, for 1-, 6-, and 24-hour durations.

Chart 44


2-YEAR 24-HOUR RAINFALL (INCHES)

REFERENCE 3

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION
01 STATE: AL
02 SITE NUMBER: D008150617

II. SITE NAME AND LOCATION

01 SITE NAME: Courtaulds Fibers Inc.
02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: Highway 43 North
03 CITY: Le Moyne
04 STATE: AL
05 ZIP CODE: 36505
06 COUNTY: Mobile
CODE: 097 01
09 COORDINATES: LATITUDE 30 53 40. LONGITUDE 088 00 50.
10 TYPE OF OWNERSHIP: ☐ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION: 11 28 90 (MONTH DAY YEAR)
02 SITE STATUS: ☑ ACTIVE ☐ INACTIVE
03 YEARS OF OPERATION: 1952 (BEGINNING YEAR) / (ENDING YEAR) ___ UNKNOWN
04 AGENCY PERFORMING INSPECTION (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR ____ (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR ____ (Name of firm)
☐ E. STATE ☐ F. STATE CONTRACTOR ____ (Name of firm) ☐ G. OTHER ____ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO
Alvin Williams	Project Manager	NUS	404/270-2872

09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO
Sam McIver	Technician	NUS	(—
Larry Grier	"	NUS	(—
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
John Stewart	Gov. Rel. + External Aff.	PO Box 141, Axis, Al 36505	205679
			( )
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one): ☐ PERMISSION ☐ WARRANT
18 TIME OF INSPECTION: 11/27/ – 11/28 all day
19 WEATHER CONDITIONS: Partly Cloudy, Windy 75°F.

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO
		( )

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
Maureen Gordon	EPA	Dynamac	404-681-0933	7/24/92

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE: AL
02 SITE NUMBER: D008150617

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)
A. SOLID
B. POWDER, FINES
[✓ C. SLUDGE]
D. OTHER ______ (Specify)
E. SLURRY
F. LIQUID
[✓ G. GAS]

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)
TONS ______
CUBIC YARDS ______
NO. OF DRUMS ______

03 WASTE CHARACTERISTICS (Check all that apply)
[✓ A. TOXIC]
B. CORROSIVE
C. RADIOACTIVE
D. PERSISTENT
E. SOLUBLE
F. INFECTIOUS
G. FLAMMABLE
H. IGNITABLE
I. HIGHLY VOLATILE
J. EXPLOSIVE
K. REACTIVE
L. INCOMPATIBLE
M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE	20yds/day	yds/day	sludge placed in impoundment
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
	Zinc				
	Sulfate				
	Sulfide				

CAS #'S can be obtained from SCDM

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

File material

Sampling results from the SI.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE AL
02 SITE NUMBER D008150617

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☐ A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED ______
02 ☐ OBSERVED (DATE 11/28/90)
☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Contamination was detected in GW during the SI. Not in a potable well.

01 ☐ B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED ______
02 ☐ OBSERVED (DATE ______)
☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Surface water or sediment were was not sampled.

01 ☐ C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED ______
02 ☐ OBSERVED (DATE ______)
☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Air was not sampled. H_2S can volatilize.

01 ☐ D. FIRE EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED ______
02 ☐ OBSERVED (DATE ______)
☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None

01 ☐ E. DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED ______
02 ☐ OBSERVED (DATE ______)
☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

There are 650 employees. Nobody lives within 1mile from the facility.

01 ☐ F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED ______ Acres
02 ☐ OBSERVED (DATE 11/28/90)
☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Soil was contaminated with inorganic chemicals including process associated chemicals ie Zn, $S^=$, $SO_4^=$

01 ☐ G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: ______
02 ☐ OBSERVED (DATE ______)
☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None was detected.

01 ☐ H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED ______
02 ☐ OBSERVED (DATE ______)
☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None.

01 ☐ I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED: ______
02 ☐ OBSERVED (DATE ______)
☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE AL
02 SITE NUMBER D008150617

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA 02 ☐ OBSERVED (DATE ________) ☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
There has been no observed damage.

01 ☐ K. DAMAGE TO FAUNA 02 ☐ OBSERVED (DATE ________) ☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION [illegible]
There has been no observed damage.

01 ☐ L. CONTAMINATION OF FOOD CHAIN 02 ☐ OBSERVED (DATE ________) ☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
Fish could potentially be contaminated in the Mobile River.

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES 02 ☐ OBSERVED (DATE ________) ☑ POTENTIAL ☐ ALLEGED
(Spills Runoff Standing liquids Leaking drums)
03 POPULATION POTENTIALLY AFFECTED: ________ 04 NARRATIVE DESCRIPTION
Contamination may leach into GW or flow into SW. Precautions taken in sludge ponds.

01 ☐ N. DAMAGE TO OFFSITE PROPERTY 02 ☐ OBSERVED (DATE ________) ☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
None has been detected. May be by SW runoff.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 ☐ OBSERVED (DATE ________) ☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
None has been observed so far.

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING 02 ☐ OBSERVED (DATE ________) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
None.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS
None.

III. TOTAL POPULATION POTENTIALLY AFFECTED: Within 4-miles 2833, 650 employees

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)
File material. Site investigation.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE: AL

02 SITE NUMBER: D008150645

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A. NPDES	Unknown			TO Mobile K.
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA	Not a RCRA FACILITY			
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE				
☐ H. LOCAL				
☐ I. OTHER				
☐ J. NONE				

It is very important that copies of permits be obtained from EPA or State

-NPDES
Part A
-air monitoring
DBL-Check.

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL	02 AMOUNT	03 UNIT OF MEASURE
☑ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☐ D. TANK, ABOVE GROUND		
☐ E. TANK, BELOW GROUND		
☑ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
☐ I. OTHER (Specify)		

04 T
☐ A
☐ B
☐ C
☐ D.
☐ E.
☐ F
☐ G. OTHER RECYCLING/RECOVERY
☐ H. OTHER (Specify)

05 OTHER

☑ A. BUILDINGS ON SITE
See site layout map

06 AREA OF SITE
665 acres

07 COMMENTS
Surface impoundment is constructed so that waste will not run over. Landfill was for nonhazardous waste, but hazardous contaminants were detected during the SI.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☑ A. ADEQUATE, SECURE ☐ B. MODERATE ☐ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.
Spill containment area. Sludge ponds lined with an enhanced, low permeability soil and soil-cement aggregate.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☐ YES ☑ NO
02 COMMENTS
Facility is fenced.

VI. SOURCES OF INFORMATION

File material. SI.

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE AL
02 SITE NUMBER D008150619

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)

	SURFACE	WELL
COMMUNITY	A ☐	B ☑
NON-COMMUNITY	C ☐	D ☑

02 STATUS

ENDANGERED	AFFECTED	MONITORED
A ☐	B ☐	C ☐
D ☑	E ☐	F ☐

03 DISTANCE TO SITE
A onsite for employees (mi)
B ______ (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING
☑ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)
☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)
☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER 3424 within 4mi

03 DISTANCE TO NEAREST DRINKING WATER WELL onsite (mi)

04 DEPTH TO GROUNDWATER 2 (ft)

05 DIRECTION OF GROUNDWATER FLOW East

06 DEPTH TO AQUIFER OF CONCERN 2 (ft)

07 POTENTIAL YIELD OF AQUIFER ______ (gpd)

08 SOLE SOURCE AQUIFER ☐ YES ☑ NO

09 DESCRIPTION OF WELLS (Including usage, depth, and location relative to population and buildings)

133' well onstte for 650 empelogees. Potable wells are not confined from the surface.

10 RECHARGE AREA
☐ YES
☐ NO
COMMENTS Unknown

11 DISCHARGE AREA
☐ YES
☐ NO
COMMENTS

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☐ A. RESERVOIR, RECREATION DRINKING WATER SOURCE
☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES
☐ C. COMMERCIAL, INDUSTRIAL
☑ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME	AFFECTED	DISTANCE TO SITE
Carters Branch	☐	2 1/4 (mi)
Cold Creek	☐	2 (mi)
Mobile R.	☐	2000 ~~(mi)~~ ft

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE A 400 NO. OF PERSONS
TWO (2) MILES OF SITE B. 235 NO. OF PERSONS
THREE (3) MILES OF SITE C 2089 NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION 1 (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE
3 Industries 53 houses

04 DISTANCE TO NEAREST OFF-SITE BUILDING - House
1 (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

650 employees.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: AL
02 SITE NUMBER: D008150617

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)
☐ A. $10^{-6} - 10^{-8}$ cm/sec ☑ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)
☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B. RELATIVELY IMPERMEABLE ($10^{-4} - 10^{-6}$ cm/sec) ☑ C. RELATIVELY PERMEABLE ($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK: unknown (ft)
04 DEPTH OF CONTAMINATED SOIL ZONE: Unknown (ft)
05 SOIL pH: unknown

06 NET PRECIPITATION: 16 (in)
07 ONE YEAR 24 HOUR RAINFALL: two ~~4.5~~ 5.5 (in)
08 SLOPE
SITE SLOPE: 0.1 %
DIRECTION OF SITE SLOPE: E
TERRAIN AVERAGE SLOPE: 1.0 %

09 FLOOD POTENTIAL
SITE IS IN Not known YEAR FLOODPLAIN
10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)
ESTUARINE
A. ______ (mi)
OTHER
B. ______ (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)
none (mi)
ENDANGERED SPECIES: ______

13 LAND USE IN VICINITY
DISTANCE TO:
COMMERCIAL/INDUSTRIAL
A. 2500' (mi)
RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES
B. N/7 (mi)
AGRICULTURAL LANDS
PRIME AG LAND
C. none (mi)
AG LAND
D. ______ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

Site slopes from 40' to 8' amsl toward the east to the Mobile R. Area is relatively flat with wetlands lining the banks of the Mobile R.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

File. Topographic map.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
AL	D008150617

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER		Data Chem, Salt Lake City,	
SURFACE WATER		Utah	
WASTE			
AIR		Southwest Research	
RUNOFF		Institute.	
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
	pH , temperature Conductivity for GW
	samples. pH ranged from
	5.0 to 5.7. Conductivity
	from 35 to 610 umhos/cm

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☐ GROUND ☐ AERIAL

02 IN CUSTODY OF ____________________ Name of organization or individual

03 MAPS ☐ YES ☐ NO

04 LOCATION OF MAPS ____________________

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

none

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SI - field book

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
AL	D008150617

II. CURRENT OWNER(S)			**PARENT COMPANY** (If applicable)		
01 NAME Courtaulds Fibers, Inc		02 D+B NUMBER	08 NAME		09 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.) Highway 43		04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE
05 CITY LeMoyne	06 STATE AL	07 ZIP CODE 36505	12 CITY	13 STATE	14 ZIP CODE
01 NAME		02 D+B NUMBER	08 NAME		09 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE
01 NAME		02 D+B NUMBER	08 NAME		09 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE
01 NAME		02 D+B NUMBER	08 NAME		09 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE

III. PREVIOUS OWNER(S) (List most recent first)			**IV. REALTY OWNER(S)** (If applicable, list most recent first)		
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

File material.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
AL	D008150617

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME Courtaulds		02 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	
08 YEARS OF OPERATION	09 NAME OF OWNER		

OPERATOR'S PARENT COMPANY (If applicable)

10 NAME		11 D+B NUMBER
12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD	
01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD	
01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE
08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD	

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 NAME		11 D+B NUMBER
12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
14 CITY	15 STATE	16 ZIP CODE
10 NAME		11 D+B NUMBER
12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
14 CITY	15 STATE	16 ZIP CODE
10 NAME		11 D+B NUMBER
12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE
14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

File

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
AL	D008150617

II. ON-SITE GENERATOR

01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE

III. OFF-SITE GENERATOR(S)

01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 STATE: AL
02 SITE NUMBER: D008150617

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
There have been no response activities.

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ D. SPILLED MATERIAL REMOVED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ E. CONTAMINATED SOIL REMOVED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ F. WASTE REPACKAGED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ G. WASTE DISPOSED ELSEWHERE 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ H. ON SITE BURIAL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ I. IN SITU CHEMICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ J. IN SITU BIOLOGICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ K. IN SITU PHYSICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ L. ENCAPSULATION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ M. EMERGENCY WASTE TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ N. CUTOFF WALLS 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ P. CUTOFF TRENCHES/SUMP 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ Q. SUBSURFACE CUTOFF WALL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
AL	D008150617

II. PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ S. CAPPING/COVERING 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ T. BULK TANKAGE REPAIRED 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ U. GROUT CURTAIN CONSTRUCTED 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ V. BOTTOM SEALED 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ W. GAS CONTROL 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ X. FIRE CONTROL 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ Y. LEACHATE TREATMENT 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ Z. AREA EVACUATED 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ 1. ACCESS TO SITE RESTRICTED 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ 2. POPULATION RELOCATED 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

01 ☐ 3. OTHER REMEDIAL ACTIVITIES 02 DATE ________ 03 AGENCY ________
04 DESCRIPTION

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
AL	D008150617

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION YES NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

None

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA FORM 2070-13 (7-81)

REFERENCE NO. 1

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE: AL
02 SITE NUMBER: D008150617

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site): COURTAULDS NORTH AMERICA
02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: HIGHWAY 43 NORTH
03 CITY: LE MOYNE
04 STATE: AL
05 ZIP CODE: 36505
06 COUNTY: MOBILE
07 COUNTY CODE: 097
08 CONG DIST: 01
09 COORDINATES LATITUDE: 30 57 40.
LONGITUDE: 088 00 50.
10 DIRECTIONS TO SITE (Starting from nearest public road): PLANT LOCATED NORTH OF AXIS, AL. ON HIGHWAY 43, RIGHT SIDE OF RD. APPROX. 5½ mi. N. FROM INTERSECTION OF HWY 43 AND I-65

III. RESPONSIBLE PARTIES

01 OWNER (If known): COURTAULDS NORTH AMERICA, INC.
02 STREET (Business, mailing, residential): P.O. BOX 2648
03 CITY: MOBILE
04 STATE: AL
05 ZIP CODE: 36652
06 TELEPHONE NUMBER: (205 675-1710
07 OPERATOR (If known and different from owner):
08 STREET (Business, mailing, residential):
09 CITY:
10 STATE:
11 ZIP CODE:
12 TELEPHONE NUMBER: ( )

13 TYPE OF OWNERSHIP (Check one)
☒ A. PRIVATE ☐ B. FEDERAL: ________ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: ________ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☒ A. RCRA 3001 DATE RECEIVED: 11 / 19 / 80 (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: __ / __ / __ (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES DATE 7 / 1 / 83 (MONTH DAY YEAR)
☐ NO
BY (Check all that apply): ☐ A. EPA ☐ B. EPA CONTRACTOR ☒ C. STATE ☐ D. OTHER CONTRACTOR ☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: ________ (Specify)
CONTRACTOR NAME(S): ________

02 SITE STATUS (Check one): ☒ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN
03 YEARS OF OPERATION: 1952 (BEGINNING YEAR) | ________ (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
SLUDGE FROM WASTEWATER TREATMENT CONTAINING SULFIDES
RAYON TOW

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
LOW POTENTIAL HAZARD. FACILITY REGULATED UNDER INTERIM STATUS AND PART B HAS BEEN CALLED FOR TREATMENT. SOME DISPOSAL OF RAYON TOW ON-SITE WHICH MAY HAVE BEEN LOW pH HOWEVER THE MATERIAL IS NOTED TO RAISE IN pH OVER TIME. MOST MATERIAL DISPOSED OFF-SITE.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☒ C. LOW (Inspect on time available basis) ☒ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT: STEVE MAURER SCM
02 OF (Agency/Organization): ADEM
03 TELEPHONE NUMBER: 205 271-7128
04 PERSON RESPONSIBLE FOR ASSESSMENT: DONALEA DINSMORE
05 AGENCY:
06 ORGANIZATION: EPS
07 TELEPHONE NUMBER: 601 922-8242
08 DATE: __ / __ / __ (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS *(Continued)*

01 ☐ J. DAMAGE TO FLORA   02 ☐ OBSERVED (DATE: ________)   ☐ POTENTIAL   ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ K. DAMAGE TO FAUNA   02 ☐ OBSERVED (DATE: ________)   ☐ POTENTIAL   ☐ ALLEGED
04 NARRATIVE DESCRIPTION *(Include name(s) of species)*

01 ☐ L. CONTAMINATION OF FOOD CHAIN   02 ☐ OBSERVED (DATE: ________)   ☐ POTENTIAL   ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES *(Spills/runoff/standing liquids/leaking drums)*   02 ☐ OBSERVED (DATE: ________)   ☐ POTENTIAL   ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ________   04 NARRATIVE DESCRIPTION

01 ☐ N. DAMAGE TO OFFSITE PROPERTY   02 ☐ OBSERVED (DATE: ________)   ☐ POTENTIAL   ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs   02 ☐ OBSERVED (DATE: ________)   ☐ POTENTIAL   ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING   02 ☐ OBSERVED (DATE: ________)   ☐ POTENTIAL   ☐ ALLEGED
04 NARRATIVE DESCRIPTION

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: ________

IV. COMMENTS

V. SOURCES OF INFORMATION *(Cite specific references, e.g., state files, sample analysis, reports)*

EPA FORM 2070-12 (7-81)

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN NO. 0143

EPA REGION:	IV
CONTRACT NO.:	68-W9-0005; TES VIII
EPA WAM:	DEBORAH VAUGHN-WRIGHT
TELEPHONE NO.:	(404) 347-5065
DYNAMAC WAM:	KATHARINE SIDERS FRANKLIN
TELEPHONE NO.:	(404) 681-0933

DOCUMENT CONTROL NO. C04123-SASS-FR-021

Submitted To

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION IV

By

DYNAMAC CORPORATION

May 28, 1993

NOTICE

The information in this document has been funded wholly by the United States Environmental Protection Agency (EPA) under Contract Numbers (FIT) 68-01-7346 and (TES VIII) 68-W9-0005 and is considered proprietary to the EPA.

This information is not to be released to third parties without the expressed or written consent of the EPA.

TABLE OF CONTENTS

Tables

Figures

Appendices

EXECUTIVE SUMMARY

Courtaulds Fibers, Inc. (Courtaulds) is located in LeMoyne, Mobile County, Alabama, approximately 7 miles north of the center of the city of Mobile. Courtaulds has operated a synthetic fiber plant at this location for the production of viscose since 1952. In this process, cellulose is treated with carbon disulfide to produce cellulose xanthate, which is treated and washed before being spun into fibers. The major wastes associated with this process are sulfate, sulfide and zinc.

Waste from the process was placed into two sludge lagoons on the Courtaulds property until 1990. It is currently being placed in a landfill directly north of the sludge lagoons. Another landfill directly west of the Mobile River was used for nonhazardous waste disposal until the 1970s.

Courtaulds is located on Highway 43 in a sparsely populated industrial/rural area. Large chemical plants are situated along this highway from 1 mile south of Courtaulds to the city of Mount Vernon on the north side of the facility. Stauffer Chemical Company (Stauffer) is located north of the facility and to the south is Shell Chemical Company. Most of the area to the east of the facility is wetlands. Because of the extensive wetlands, little farming is done. However a limited amount of timber, pulpwood and cypress is harvested.

Some threatened and endangered species have ranges within the study area, but there are no critical habitats. Both sport and commercial fishing occur in the Mobile River, which borders the site, and in Mobile Bay south of the facility.

The Courtaulds property is relatively flat with surface water runoff directed north, south and east. An intermittent creek toward the north drains into Cold Creek, into Cold Creek Swamp and then into the Mobile River toward the east. Another intermittent creek on the southern portion of the property flows south through a wetlands area toward the east then into the Mobile River. Runoff also flows directly to the east to the Mobile River.

Courtaulds is located on the alluvial plain of the Mobile River in the Coastal Plain physiographic province of Alabama. Two hydrologically connected aquifers are utilized in Mobile County, Alabama: the alluvial-coastal aquifer and the underlying Pliocene-Miocene aquifer. Groundwater in the alluvial-coastal aquifer is under water table conditions except where it is locally confined by clay. Groundwater in the Pliocene-Miocene aquifer occurs in lenticular beds of sand and gravel of limited extent and is unconfined and hydrologically connected to land surface. However, wells that are drilled into deeper areas of the Pliocene-Miocene aquifer respond to pumping as in a confined aquifer.

The potable water in most of the study area is obtained from either the LeMoyne Water System or the Mount Vernon Water System. The LeMoyne Water System wells are within three miles of Courtaulds. Residents not served by either system have private wells. Additionally, Courtaulds, Stauffer and M & T Chemicals utilize onsite potable wells for water supplies.

Surface soil, subsurface soil, sediment, and groundwater samples collected during the Site Inspection (SI) contained elevated concentrations of inorganic contaminants. Elevated concentrations of at least one of the contaminants associated with the viscose process (zinc, sulfide or sulfate) were detected in four surface soil, two subsurface soil, two sediment and four groundwater samples. Other inorganic contaminants detected at elevated concentrations in at least one surface soil sample included the following: arsenic, copper, chromium, lead, mercury and vanadium. Additionally, sediment samples collected from sludge lagoons contained the following inorganic contaminants: barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury and nickel. Toluene was also detected in the sludge lagoon sediment samples. Three surface soil samples contained organic compounds such as polynuclear aromatic hydrocarbons (PAHs) phthalates and Aroclor 1260. The areas of greatest contamination were the sludge lagoons and the landfill.

1.0 INTRODUCTION

In 1990, The EPA Waste Management Division tasked the NUS Corporation (NUS), the EPA Region IV Field Investigation Team (FIT), to conduct a Phase II Screening Site Inspection (SSI) at Courtaulds Fibers. Inc. (Courtaulds) in LeMoyne, Mobile County, Alabama. The investigation was performed under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The investigation was performed to satisfy the requirements stated in Technical Directive Document (TDD) number F4-9011-21. The field investigation was conducted on November 27 and November 28, 1990.

EPA tasked Dynamac Corporation (Dynamac), an EPA Technical Enforcement Support (TES) contractor, to complete the Site Inspection (SI) Report utilizing the results of the FIT field study. This activity was conducted to fulfill the requirements of Task 14 of the TES VIII Work Assignment No. C04123, Site Assessment Special Studies. Dynamac's responsibilities included:

- Gathering the existing FIT files from the EPA Waste Management Division;
- Filling existing data gaps wherever possible;
- Preparing the complete SI report; and
- Making a recommendation concerning further action at the site.

1.1 Objectives

The objectives of this inspection were to determine the nature of the contaminants present at Courtaulds (the site) and to determine if a release of these substances has occurred or may occur. Additionally, this inspection sought to determine possible pathways by which contamination could migrate from the site and the populations and environments the contamination would potentially affect. Also a recommendation will be made regarding future activities at the site.

1.2 Scope Of Work

The objectives were achieved through the completion of the following tasks:

- Obtaining and reviewing background materials relevant to HRS scoring of the site;
- Generating a map of the site;
- Evaluating target populations associated with the groundwater, surface water, air and soil exposure pathways:
- Collecting 20 environmental samples (all sample collection was conducted by NUS Corporation);
- Developing analytical results tables from the Contract Laboratory Program (CLP) data; and
- Writing a presentation of analytical results.

2.0 SITE CHARACTERIZATION

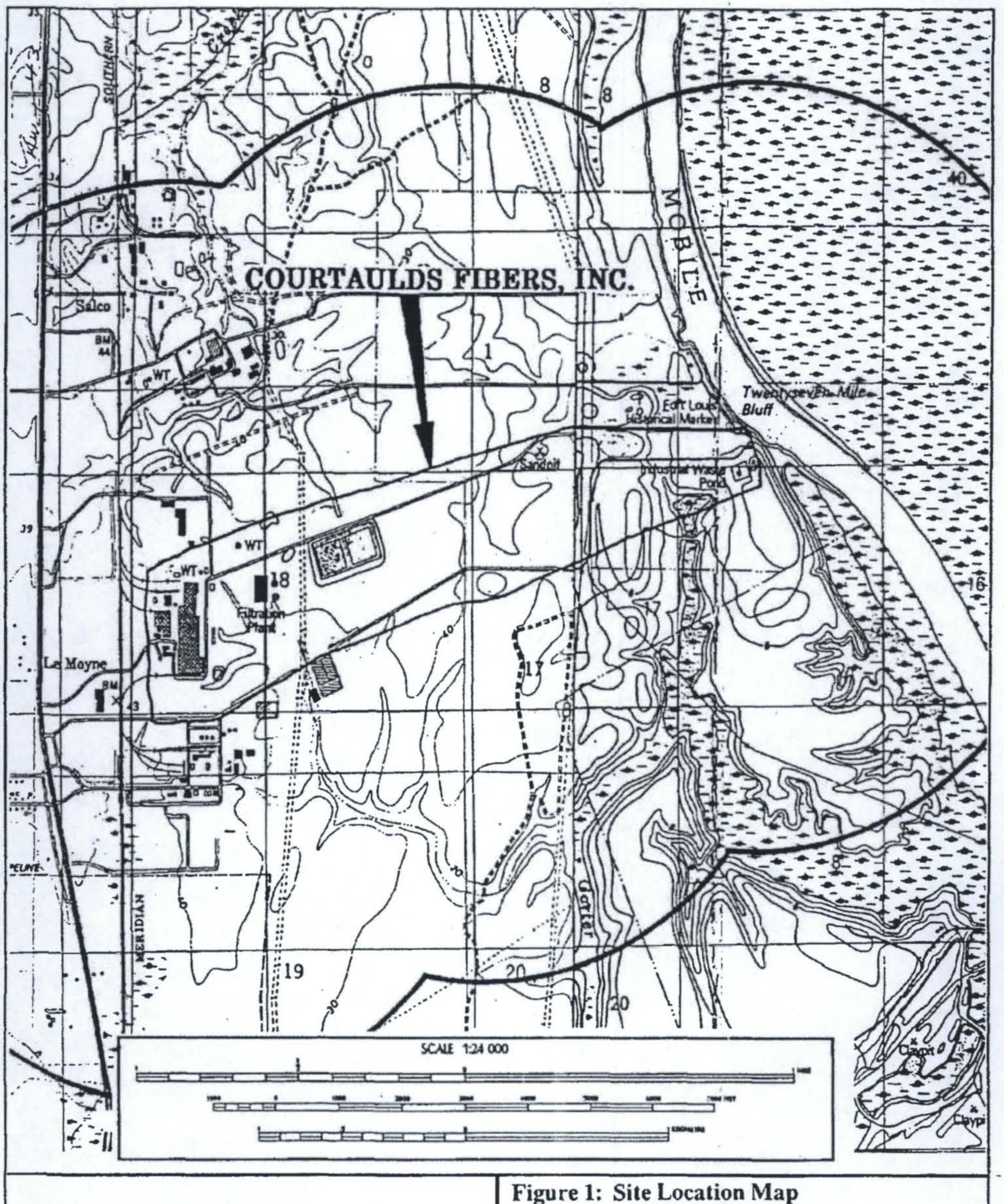
2.1 Site Background and History

Courtaulds is located in LeMoyne, Mobile County, Alabama, on Highway 43 approximately 7 miles north of the center of the city of Mobile (Appendix A) (Ref. 1). The coordinates of the facility are 30° 57′ 40″ north latitude and 88° 00′ 50″ west longitude (Figure 1). The EPA ID No. is ALD008150617 and the WasteLan number is 0143.

Courtaulds has operated a synthetic fiber facility at the LeMoyne location since 1952 producing synthetic fibers via the viscose rayon process (Refs. 2; 3, p. 1-1). The viscose process consists of treating cellulose with alkali and carbon disulfide to produce cellulose xanthate, which is also known as viscose. The viscose is then treated in a sulfuric acid bath containing sulfate salts, washed and then stirred in a tank containing a dilute caustic solution. The caustic solution dissolves the viscose. The dissolved viscose is then ripened and spun to form the fibers. During the spinning process, the viscose is extruded into a bath containing salt and acid (Ref. 4, p. 856-862).

Waste from this process is composed of 15 to 20 cubic yards per day of sludge containing cellulose, sodium sulfate, sulfuric acid, carbon disulfide, zinc sulfate and hydrogen disulfide. The sludge was placed in lagoons located on the Courtaulds property until 1990. Currently, it is being deposited in a landfill north of the sludge pond area (Ref. 5). Hydrogen disulfide and carbon disulfide, which are gases under ambient conditions, vaporize from the waste. Sulfide salts are produced from the sulfate salts by anaerobic reduction in the lagoons. The sulfides combine with the zinc ions present in the sludge to form insoluble zinc sulfide (Refs. 3; 6).

Title 40, Code of Federal Regulations, Part 261 (40 CFR 261), promulgated in 1976 under the authority of the Resource Conservation and Recovery Act (RCRA), identified the sulfide waste as being hazardous between the pH of 2 and 12.5 since toxic gases, vapors or fumes could be generated in this pH range. Due to the lack of clearly defined guidelines on determining if Courtaulds' waste was hazardous, Courtaulds filed a RCRA Part A application as a protective filer in November 1980 (Ref. 29, p. 1). As required by RCRA regulations, Courtaulds also began a groundwater monitoring program for the sludge lagoons (Ref. 3, pp. iii, 2-6). In August 1985, Courtaulds filed a revised Part A application which was to be incorporated into their Part B application (Ref. 30, p. 1). After



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CORPORATION
Environmental Services

Figure 1: Site Location Map
COURTAULDS FIBERS, INC.
Lemoyne, Mobile County, Alabama
Source: USGS 7.5 minute series Topographic Maps of Creola, AL 1982 (photorevised 1985) and The Basin, AL 1980.

determining that the sludge in the lagoons at Courtaulds was classified as being nonhazardous, the Alabama Department of Environmental Management (ADEM) withdrew Courtaulds interim status (Refs. 31; 32, pp. 1, 2). Courtaulds has a National Pollutant Discharge Elimination System (NPDES) permit which expires on April 30, 1997. Numerous solvents, metals and polynuclear aromatic hydrocarbons (PAHs) are being regulated and discharged to the Mobile River, an unnamed tributary of Carter Branch and an unnamed tributary of Cold Creek (Ref. 33, p. i, Part I, pp. 1-1f). Available information does not indicate whether violations of this permit have occurred.

During an EPA RCRA investigation in 1990 concerning toxic emitters in the area, Courtaulds was identified as the "primary emitter" (Ref. 7). Air monitoring has been conducted at Courtaulds since 1979 and is currently ongoing. According to ADEM personnel, carbon disulfate and hydrogen sulfide are the two discharges of greatest concern. These discharges are from the spinning lines of Courtaulds' viscose process (Ref. 34).

There have been two remedial investigations (RI) north of Courtaulds. One RI was conducted at the Stauffer facility, directly north of Courtaulds, in 1988. Carbon disulfide and carbon tetrachloride were the primary contaminants detected in groundwater during this investigation (Ref. 8, pp. 7, 8). Carbon disulfide is associated with the viscose process used at Courtaulds (Ref. 2, p. 1). Carbon disulfide is also associated with facility processes at Stauffer (Ref. 8, p. 1).

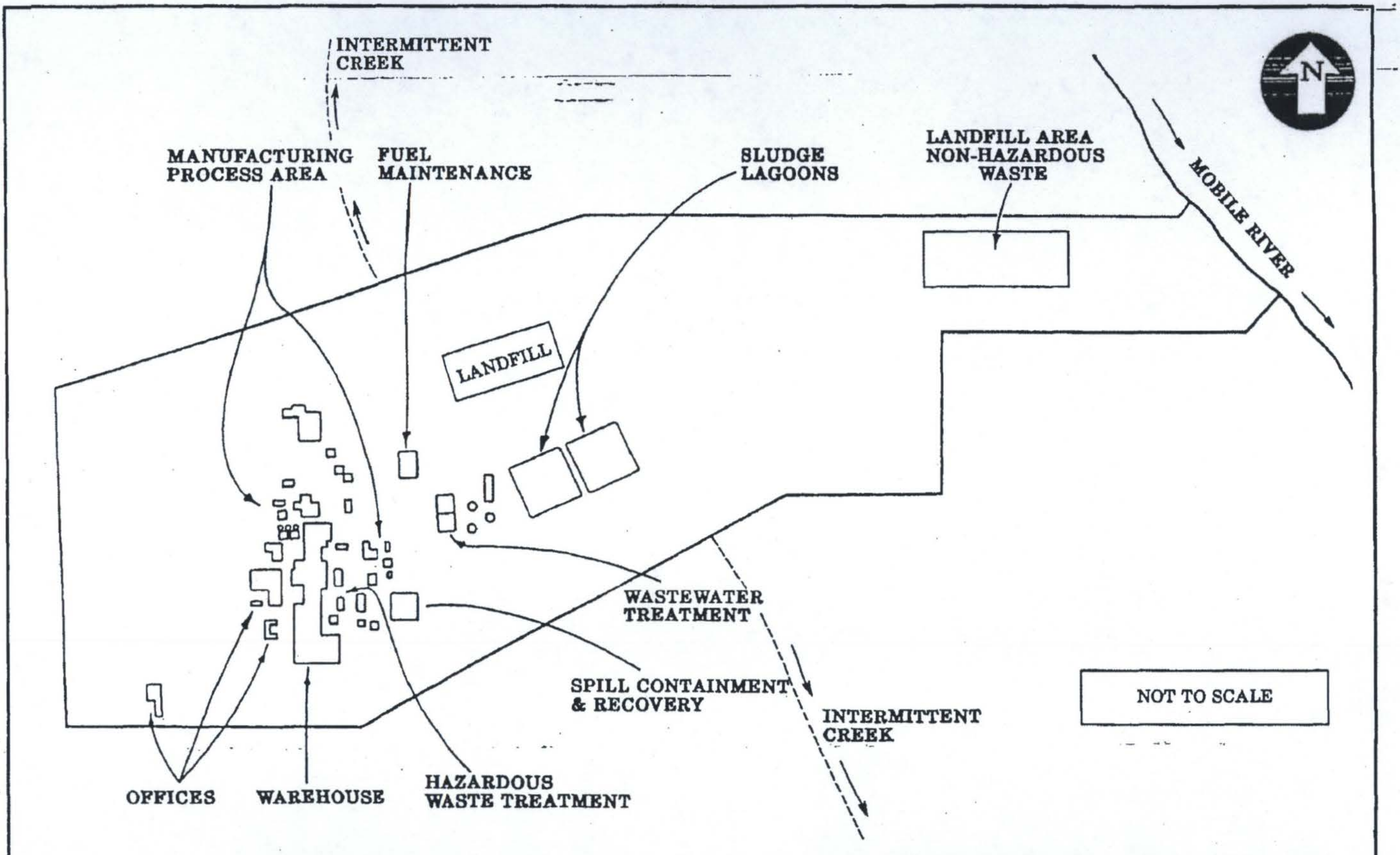
The second RI was conducted for the Cold Creek Swamp, which is located north of Stauffer and which discharges into the Mobile River. Surface water runoff from the north boundary of Courtaulds flows into this swamp. Mercury was the primary contaminant detected during this investigation (Ref. 9, Table 1-3). Mercury's association with the Courtaulds process is unknown; however, mercury is one of Courtaulds' NPDES-regulated parameters and was found in onsite samples collected during this study (Appendix B; Ref. 33, p. 1e).

2.2 Site Description

Courtaulds is located on approximately 665 acres. Highway 43 forms the western border of the site and the Mobile River flows along the eastern border. There is a Southern Railroad track running through the property approximately 1,200 feet east of the highway. A fence surrounds the majority of the property enclosing the manufacturing building, office and waste areas. The manufacturing and office buildings are located directly east of the western side of the fence.

The wastewater treatment plant is located east of the manufacturing building. Two sludge lagoons (each approximately 5.3 acres in size) are directly east of the wastewater treatment plant and a limited waste landfill is located north of the sludge lagoons (Ref. 3, Figure 1-2, p. 1-5). The Mobile River is 1.1 miles east of the sludge lagoons, while a nonhazardous waste landfill (approximately 13 acres) is located 1,500 feet west of the river (Refs. 3, pp. 5-5, 5; 7). The landfill has not been used since the 1970s. A site layout map appears on Figure 2.

The sludge lagoons are lined with an enhanced, low permeability soil and soil-cement aggregate. These lagoons are constructed with 2 feet of freeboard on all sides to prevent waste from spilling and flowing toward the Mobile River (Ref. 3, p. iv). The sludge lagoons are currently inactive (Ref. 7). However, file material does not indicate if they were remediated.



Source: Modified from Site Layout map prepared by NUS Corporation.

DYNAMAC CORPORATION
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Figure 2 : Site Layout Map
COURTAULDS FIBERS, INC.
LeMoyne, Mobile County, Alabama

3.0 REGIONAL POPULATIONS AND ENVIRONMENTS

3.1 Population and Land Use

The following sections discuss demography, land use and sensitive environments within a 4-mile radius of Courtaulds.

3.1.1 Demography

Courtaulds is located in a sparsely populated rural/industrial area of Mobile County. Industry in the area is located along U.S Route 43. Courtauld's neighbors are Stauffer Chemical Company (Stauffer) on the northern border and Shell Chemical Company on the southern border (Refs. 3, p. 2-6; 10). Most of the residences within the 4-mile radius are located south of the facility, along Highway 43 (Appendix A).

The nearest population centers include the city of Mt. Vernon (population 1,038), located approximately 8 miles north of the site, and the city of Creola (population 673), located approximately 5 miles south of the site (Appendix A) (Ref. 8, p. 6-1).

A house count using U.S. Geological Survey (USGS) topographic maps and population values from the Graphical Exposure Modeling System (GEMS) data base were used to estimate the population within 4 miles of Courtaulds. The U.S. Bureau of the Census household multiplier for Mobile County is 2.71 persons per household. Courtaulds has 650 employees. Stauffer is located within 1 mile of Courtaulds and employs approximately 450 people (Refs. 5; 8, pp. 1-4 to 1-6). M & T Chemicals is located approximately 1.5 miles to the north of Courtaulds and employs approximately 200 people (Ref. 8, pp. 1-4 to 1-6). The residential and industrial population within a 4-mile radius is estimated as 2,233 people with the distribution indicated below (Appendix A) (Refs. 11; 12).

Radial Distance	Households	Industrial	Population Residential and Industrial)
0 - 0.25 mile	0	650	650
0.25 - 0.50 mile	0	0	0
0.50 - 1 mile	4	450	461
1 - 2 miles	49	200	333
2 - 3 miles	100	0	271
3 - 4 miles	191	0	518
Totals	344	1,300	2,233

3.1.2 Land Use

Approximately two-thirds of the land to the west, south and north within 4 miles of Courtaulds is rural/residential. The closest residence is approximately 3,000 feet west of one of the facility's waste disposal areas, the sludge ponds. Highway 43 runs north and south through this rural/residential area. Large plants, most related to the chemical industry, are located along the highway. The remaining one-third of land within the 4-mile radius consists of wetlands and rivers. Little farming is done in the area because of the extensive wetlands (Appendix A) (Refs. 8, pp. 2-1, 2-2; 10, pp. 2-5).

The major natural resource in the area is the Mobile River which flows adjacent to Courtaulds on the eastern border of the property (Appendix A) (Ref. 8, p. 2-2). Oil wells have been drilled within 5 to 10 miles of the facility, but oil has not been discovered. Additionally, some cypress trees and pulpwood are harvested on the east side of the Mobile River (Ref. 8, p. 2-2).

3.1.3 Sensitive Environments

The habitats of several Federal (F) and State (S) designated endangered (E) or threatened (T) species exist in the Mobile County area. These include the following: the eastern indigo snake (Drymarchon corais couperi) (F, T); gopher tortoise (Gopherus polyphemus) (F, T); Alabama red-bellied turtle (Pseudemys alabamensis) (F, E); American alligator (Alligator mississippiensis) (F, T); Florida panther (Felis concolor coryi) (F, E); red wolf (Canis rufus) (S, E); wood stork (Mycteria americana) (S, E); bald eagle (Haliaeetus leucocephalus) F, E); Bachman's warbler (Vermivora bachmanii) (F, E); Eskimo curlew (Numenius borealis) (S, E); Arctic peregrine falcon (Falco peregrinus tundrius) (F, T); ivory-billed woodpecker (Campehilus principalis) (S, E); and red-cockaded woodpecker (Picoides borealis); (S, E). There are no critical habitats listed for Mobile County (Refs. 13, 14, 15).

3.2 Surface Water

The following sections discuss climatology, overland drainage and potentially affected surface water bodies along a 15-mile surface pathway. Surface water use and aquatic sensitive environments are also discussed.

3.2.1 Climatology

The climate of Mobile County is primarily humid and subtropical. Summers are warm and humid, and winters are mild. Temperatures are consistent with a mean annual variation in temperature of 10 °C. Summer temperatures range from 21 °C to 32 °C and winter temperatures range from 4 °C to 16 °C (Ref. 16, p. 130).

The normal annual rainfall in coastal Alabama is the highest in the state and among the highest in the United States, with an average annual precipitation of 64 inches and a net precipitation of 16 inches (Refs. 17, pp. 43, 63). Rainfall is distributed evenly through the year (Ref. 16). The 2-year, 24-hour rainfall is 5.5 inches (Ref. 18, p. 95).

3.2.2 Overland Drainage and Potentially Affected Water Bodies

The Courtaulds property is relatively flat and is approximately 40 feet above mean sea level (msl). Surface water runoff from the facility drains overland in all four directions to land that is 20 feet above msl. An unnamed, intermittent creek on the southern border of Courtaulds flows southeast. for approximately 1 mile before converging with Carter's Branch. Carter's Branch flows east through a wetlands area for approximately 3 miles before it converges with the Mobile River (Appendix A). Another unnamed, intermittent creek, located on the northern border, flows north for approximately 2 miles to Cold Creek which flows toward the east through a wetlands area for 2 miles before entering the Mobile River (Ref. 9, p. 1-11). The Mobile River is located on the eastern border of Courtaulds, approximately 1.1 miles from the sludge lagoons and 1,500 feet east of the nonhazardous waste landfill. The eastern and western banks of the Mobile River are lined with wetlands. The Mobile River flows south for more than 15 miles and empties into Mobile Bay (Appendix A).

Potentially affected water bodies include Cold Creek, Carter's Branch, the Mobile River and the wetlands located along the banks of the Mobile River (Appendix A). The Mobile River north of Mobile Bay is a major area for commercial and sport fishing. Among the fish that are caught are a variety of catfish, bluegill and striped bass. Additionally, the Mobile Bay delta is a spawning area for shrimp, crabs and oysters. No studies have been conducted during the last 10 years to determine the quantity of fish or shellfish caught in the area along the surface water migration pathway to Mobile Bay (Ref. 19).

3.2.3 Aquatic Sensitive Environments

There are no aquatic sensitive environments specifically designated along the 15-mile surface water migration pathway. However, some of the Federal and State threatened and endangered species mentioned in Section 3.1.3, may occur along the Mobile River or in the wetlands areas in particular the following: the Federally-designated threatened species, the eastern indigo snake (Drymarchon corais couperi), the gopher tortoise (Gopherus polyphemus) and the American alligator (Alligator mississippiensis); the Federally-designated endangered species, the Alabama red-bellied turtle (Pseudemys alabamensis); and the State-designated threatened species, the Gulf sturgeon (Acipenser oxyrhynchus. Additionally, 25,000 acres of the Mobile delta are in the process of becoming designated as a wildlife management area. However, this area may be outside the 15-mile migration pathway (Appendix A) (Ref. 19).

3.3 Groundwater

The following sections discuss hydrogeology and aquifer use within the Courtaulds study area.

3.3.1 Hydrogeology

The Courtaulds facility is located on the alluvial plain of the Mobile River in the Coastal Plain physiographic province of Alabama. Elevations along the alluvial plain range from sea level to 100 feet above msl (Ref. 20, p. 3). The elevation of the Courtaulds facility is approximately 40 feet above msl (Appendix A).

Geologic units that underlie the Courtaulds facility include, in descending stratigraphic order, terrace and alluvial deposits unconformably underlain by the Miocene Series undifferentiated (Ref. 20, pp. 6, 7). The Pliocene-age Citronelle Formation was eroded away by the Mobile River before the deposition of the alluvial deposits (Ref. 21, p. 2). The upper part of the terrace and alluvial deposits consists of decayed organic matter and carbonaceous clay that grades downward into fine argillaceous sand, coarse sand and gravel interbedded with lenticular clay beds. The terrace and alluvial deposits range from 80 to 150 feet thick (Ref. 22, pp. 11, 12). The Miocene Series undifferentiated consists of gray, dense clay; sandy clay; fine argillaceous sand and medium to coarse sand; and gravelly sand at the base (Ref. 22, p. 12). The Miocene sediments are wedge-shaped and dip to the southwest at a rate of 15 to 25 feet per mile (Refs. 20, p. 5; 22, p. 12). The Miocene Series undifferentiated is approximately 1,000 feet thick in the area (Ref. 20, p. 7).

There are two hydrologically connected aquifers utilized in Mobile County, Alabama: the alluvial-coastal aquifer and the underlying Pliocene-Miocene aquifer. The alluvial-coastal aquifer beneath the Courtaulds facility consists of the terrace and alluvial deposits adjacent to the Mobile River (Ref. 20, pp. 6, 9). Groundwater in the alluvial-coastal aquifer is under water table conditions except where locally confined by clay (Ref. 21, p. 30). The higher yielding wells in this aquifer are screened in sand and gravel beds (Ref. 20, p. 9).

The underlying Pliocene-Miocene aquifer comprises the Miocene Series undifferentiated (Ref. 20, p. 9). Pliocene-age deposits are missing beneath the site (Ref. 21, p. 2). Groundwater in the Pliocene-Miocene aquifer occurs in lenticular beds of sand and gravel of limited extent and is unconfined and hydrologically connected to the land surface. With depth, clay layers in the Miocene Series undifferentiated restrict vertical movement of water. Thus, wells that are drilled into the deeper parts of the Pliocene-Miocene aquifer respond to pumping as in a confined aquifer (Ref. 20, p. 9).

Groundwater in the Mobile County area is recharged primarily by precipitation (Refs. 20, p. 9; 21, p. 28). Most recharge to the major aquifers in the area of the facility occurs within the boundaries of Mobile County. A small amount of recharge occurs at Miocene outcrops north of the county (Ref. 20, p. 10). The Courtaulds facility is located in a recharge area that has been determined to be highly susceptible to surface contamination (Ref. 20, plate 1). This area has a relatively flat terrain with very permeable soils (Ref. 20, p. 11).

3.3.2 Aquifer Use

Most of the potable water in the area is obtained from either the LeMoyne Water System or Mount Vernon Water System. The wells for the LeMoyne Water Wystem are between 2 and 3 miles south of Courtaulds, while the Mount Vernon Water System wells are outside the study area. The LeMoyne Water System wells are approximately 130 feet deep and serve 720 connections (720 connections x 2.71 persons per household = 1,951 people). Those people not on either system obtain potable water from private wells (Refs. 23; 24; 25; 26; 27). The nearest household with a private well is located approximately 5,000 feet west of the facility sludge ponds (Appendix A) (Ref. 10).

Employees of Courtaulds obtain potable water from a well located on the northwest portion of the property. There are currently 650 employees at Courtaulds (Refs. 5; 28, p. 9). Stauffer, toward the north, also obtains potable water from three wells on its property (approximately 4,000 feet northwest of the Courtaulds sludge ponds). These wells serve approximately 450 employees (Ref. 8, pp. 1-4, 1-6, 6-2). M & T Chemicals, located approximately 1.5 miles to the north, also obtains potable water for its 200 employees from its own well (Ref. 8, pp. 1-4 and 1-6).

The following is a list of households and related populations that have private wells within a 4-mile radius of Courtaulds. The fourth column is the total population served by wells including private, municipal and potable wells at Courtaulds, Stauffers and M & T Chemicals. Residential population was estimated by using the U.S. Bureau of Census household multiplier for Mobile County (2.71 persons/household) (Ref. 12).

Radial Distance	Households	Residential Population	Total Population
0.0 - 0.25 miles	0	0	0
0.25 - 0.5 miles	0	0	650
0.5 - 1 mile	1	3	453
1 - 2 miles	13	35	235
2 - 3 miles	51	138	2,089
3 - 4 miles	12	33	33
Totals	77	209	3,460

In summary, approximately 209 residents obtain potable water from private wells within a 4-mile radius of Courtaulds. Additionally, 1,300 employees of Courtaulds and neighboring industries obtain potable water from onsite wells. Another 1,951 people obtain their drinking water from the LeMoyne water system from wells located within the study area. Therefore, 3,460 people obtain potable water from wells located within 4 miles of Courtaulds.

4.0 FIELD INVESTIGATION

4.1 Sample Collection

During the field investigation conducted the week of November 27, 1990, Region IV FIT attempted to identify and characterize contaminants which may be present in the environment as a result of the activities conducted at Courtaulds. To accomplish this, FIT collected environmental surface soil, subsurface soil, sediment and groundwater samples from a number of strategic locations. These locations were selected based on historical information, hydrogeological data for the region and site area and direct observation at the site.

4.1.1 Sample Collection Methodology

All sample collection, sample preservation and chain-of-custody procedures used during the investigation were in accordance with the standard operating procedures as specified in sections 3 and 4 of the EPA, Region IV, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (ECB SOPQAM), Environmental Services Division, (Athens, Georgia, 1990).

4.1.2 Duplicate Samples

Region IV FIT offered split samples to John M. Stewart, a representative of Courtaulds, who declined the samples.

4.1.3 Description of Samples and Sample Locations

During the sampling investigation, Region IV FIT collected 20 environmental samples: seven surface soil, five subsurface soil, two sediment and six groundwater samples.

One set each of surface soil and subsurface soil samples were collected from five soil boring locations. One set was collected in the northwest portion of the property and served to establish background conditions.

Two surface soil samples were collected individually without corresponding subsurface soil samples. Two sediment samples were collected from the sludge lagoons. One groundwater sample was collected from a drinking water well on the northwest corner of the property to establish background conditions. The remaining five groundwater samples were collected from onsite process wells.

Sample location maps are presented as figures 3 and 4. Table 1 contains a summary of sample codes, descriptions, locations and rationale.

4.1.4 Field Measurements

Field measurements were performed on all water samples (Table 2). Parameters measured included temperature, pH and conductivity of the samples at the time of collection.

4.2 Sample Analysis

The following sections discuss analytical support and methodology, analytical data quality and data qualifiers and the presentation of analytical results.

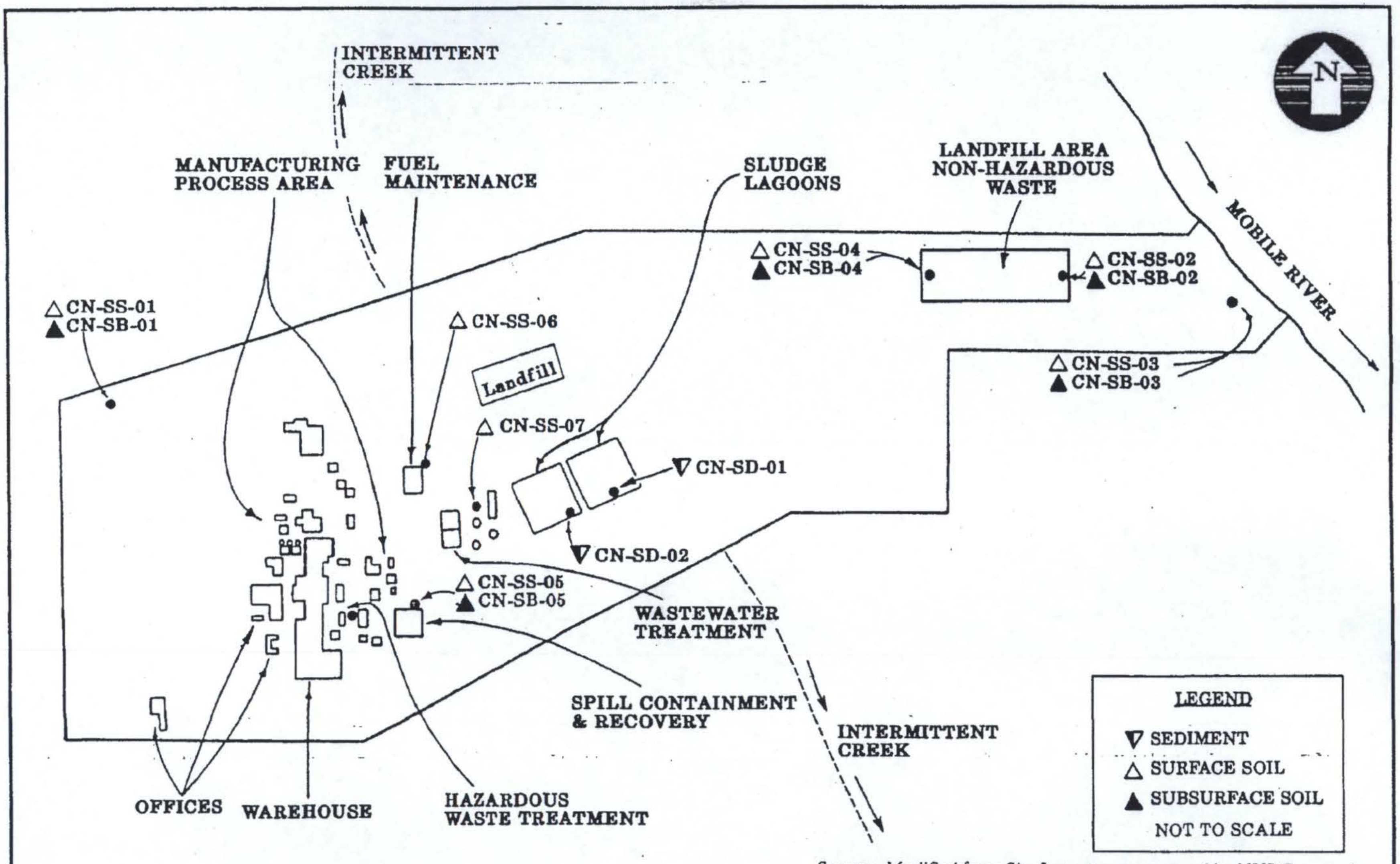
4.2.1 Analytical Support and Methodology

All samples collected during this investigation were analyzed under the Contract Laboratory Program for all parameters listed in the Target Analyte List (TAL) and Target Compound List (TCL). DataChem of Salt Lake City, Utah, conducted organic analyses of soil and water samples. Southwest Research Institute of San Antonio, Texas, conducted inorganic analyses of soil and water samples.

All laboratory analyses and laboratory quality assurance (QA) procedures used during this investigation were in accordance with standard procedures and protocols as specified in the EPA Region IV Laboratory Operations and Quality Control Manual, Environmental Services Division (October 24, 1990) or as specified by the existing EPA standard procedures and protocols for the CLP statement of work (SOW), as applicable.

4.2.2 Analytical Data Quality and Data Qualifiers

All the analytical data were subjected to a review as described in the EPA Environmental Services Division laboratory data evaluation guidelines. In the tables containing organic and inroganic analytical results, some of the concentrations of the organic and inorganic parameters have been flagged with a "J." This indicates that the qualitative analysis was acceptable, but the quantitative value has been estimated. Other compounds are flagged with an "N," indicating that they were detected based upon presumptive evidence of their presence. This means that a compound was tentatively identified, and its detection cannot be used as positive identification of its presence. Results for some background samples are flagged with a "U." This flag means that the material was analyzed for, but not detected. The reported number is the



Source: Modified from Site Layout map prepared by NUS Corporation.

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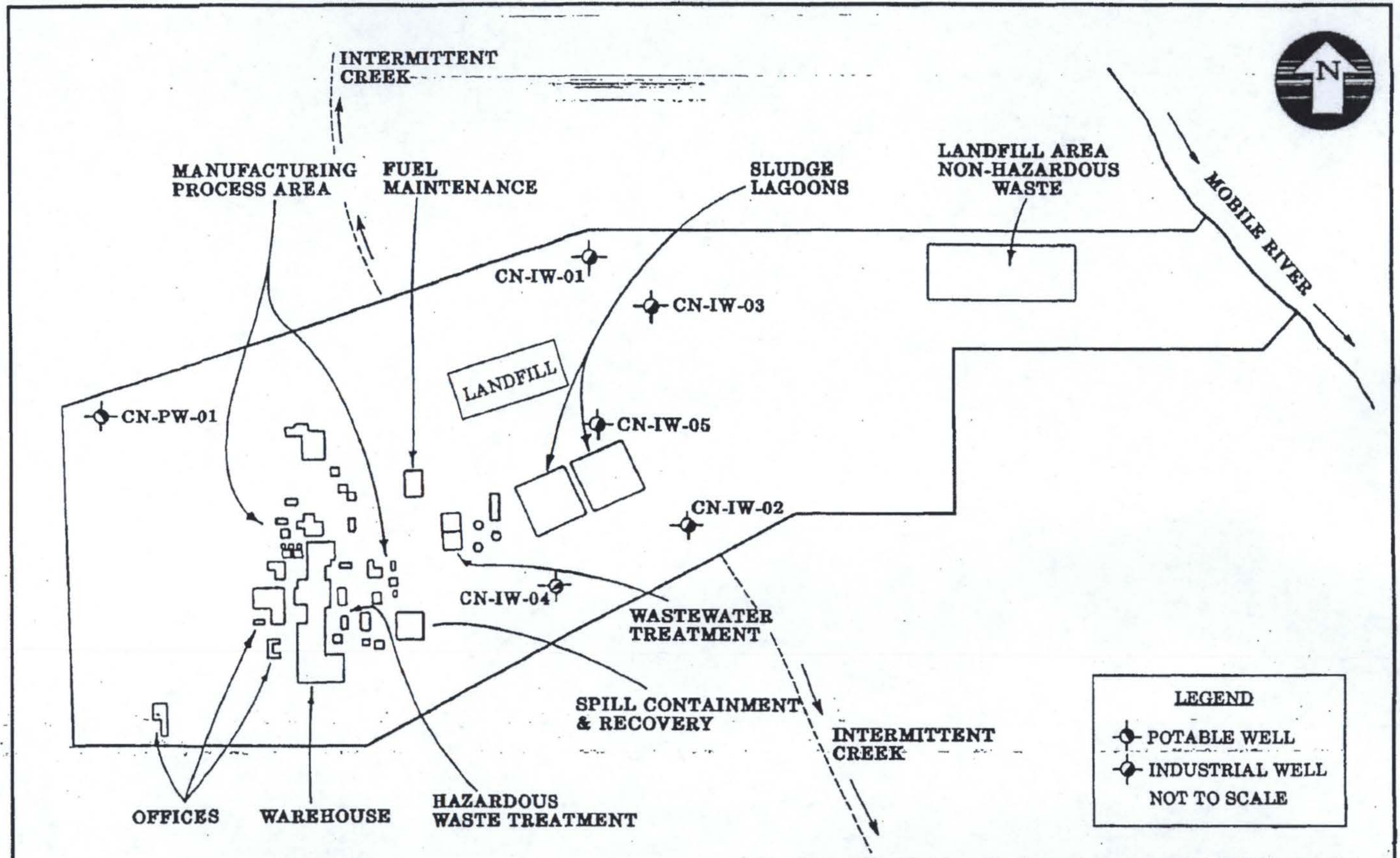
Figure 3 : Soil and Sediment Sample Location Map
COURTAULDS FIBERS, INC.
Lemoyne, Mobile County, Alabama



Source: Modified from Site Layout map prepared by NUS Corporation.

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Figure 4 : Groundwater Sample Location Map
COURTAULDS FIBERS, INC.
Lemoyne, Mobile County, Alabama

TABLE 1

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN No. 0143

SAMPLE CODES, DESCRIPTIONS, LOCATIONS AND RATIONALE

SAMPLE CODE	DESCRIPTION	LOCATION	RATIONALE
CN-SS-01	Surface Soil	Northwest corner of property, 6 inches (bls).	Establish background conditions.
CN-SS-02	Surface Soil	Eastern portion of non-hazardous waste landfill, 6 inches bls.	Determine the presence or absence of contaminants.
CN-SS-03	Surface Soil	West of Mobile River, 6 inches bls.	Determine the presence or absence of contaminants.
CN-SS-04	Surface Soil	Western portion of non-hazardous waste landfill, 6 inches bls.	Determine the presence or absence of contaminants.
CN-SS-05	Surface Soil	Spill containment area, 6 inches bls.	Determine the presence or absence of contaminants.
CN-SS-06	Surface Soil	Fuel maintenance area, 6 inches bls.	Determine the presence or absence of contaminants.
CN-SS-07	Surface Soil	West of sludge lagoons by manufacturing plant, 6 inches bls.	Determine the presence or absence of contaminants.
CN-SB-01	Subsurface Soil	In conjunction with CN-SS-01, 4.5 feet bls.	Establish background conditions.
CN-SB-02	Subsurface Soil	In conjunction with CN-SS-02, 4.5 feet bls.	Determine the presence or absence of contaminants.

CN = Courtaulds
SS = Surface Soil
SB = Subsurface Soil
bls = below land surface

TABLE 1

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN No. 0143

SAMPLE CODES, DESCRIPTIONS, LOCATIONS AND RATIONALE

SAMPLE CODE	DESCRIPTION	LOCATION	RATIONALE
CN-SB-03	Subsurface Soil	In conjunction with CN-SS-03, 4.5 feet bls.	Determine the presence or absence of contaminants.
CN-SB-04	Subsurface Soil	In conjunction with CN-SS-03, 4.5 feet bls.	Determine the presence or absence of contaminants.
CN-SB-05	Subsurface Soil	In conjunction with CN-SS-05, 4.5 feet bls.	Determine the presence or absence of contaminants.
CN-SD-01	Sediment	East sludge lagoon.*	Characterize site contaminants.
CN-SD-02	Sediment	West sludge lagoon.*	Characterize site contaminants.
CN-PW-01	Groundwater	Potable water well on northwest corner of property; depth 110 feet bls.	Establish background conditions.
CN-IW-01	Groundwater	Process well on northern border, north of sludge lagoons; depth 128 feet bls.	Determine the presence or absence of contaminants.
CN-IW-02	Groundwater	Process well southeast of sludge lagoons; depth 122 feet bls.	Determine the presence or absence of contaminants.
CN-IW-03	Groundwater	Process well northeast of sludge lagoons; depth 132 feet bls.	Determine the presence or absence of contaminants.
CN-IW-04	Groundwater	Process well southwest of sludge lagoons; depth 116 feet bls.	Determine the presence or absence of contaminants.
CN-IW-05	Groundwater	Process well north of sludge lagoons; depth 116 feet bls.	Determine the presence or absence of contaminants.

CN = Courtaulds
SB = Subsurface Soil
SD = Sediment
PW = Potable Well
IW = Industrial Well
bls = below land surface

* = Depths at which sludge samples were collected were not provided in the field logbook.

TABLE 2

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN NO. 0143

FIELD MEASUREMENTS

SAMPLE CODE	TEMPERATURE(°C)	CONDUCTIVITY (umhos/cm)	pH
CN-PW-01	23	37	5.2
CN-IW-01	21	610	5.2
CN-IW-02	19	130	5.7
CN-IW-03	19	35	5.3
CN-IW-04	19	120	5.0
CN-IW-05	19	115	5.0

CN = Courtaulds
PW = Potable Well
IW = Industrial Well
umhos/cm = micromhos/centimeters

laboratory-derived minimum quantitation limit (MQL) for the compound or element in that sample.

At times, miscellaneous organic compounds that do not appear on the TCL are reported with a data set. These compounds are labeled "JN," indicating that they are tentatively identified as estimated quantities. Because these compounds are not routinely analyzed for or reported, background levels or MQL values are not generally available for comparison. The complete analytical data sheets are presented in Appendix B.

4.2.3 Presentation of Analytical Results

This section presents a discussion and interpretation of the analytical results from the environmental samples collected during the FIT investigation conducted at Courtaulds. Analytical results for the soil and sediment samples are presented in Tables 3 and 4. Analytical results for the groundwater samples are presented in Tables 5 and 6. Background or control samples have been designated for all media. Values for background or control samples are presented either as a measured concentration or as the MQL if the analyte was not detected. Concentrations of contaminants that are greater than three times control concentrations are considered to be elevated. If the contaminant was reported as an MQL in the control sample, any value greater than MQL for that contaminant is considered to be elevated.

4.2.3.1 Soil and Sediment Sampling Results

Six surface soil and four subsurface soil samples were collected in addition to two corresponding control samples. Four surface soil samples contained elevated concentrations of inorganic contaminants. The surface soil sample collected on the western portion of the nonhazardous waste landfill contained arsenic (4 times control), copper (5 times control), lead (13 times control), mercury (7 times control) and zinc (35 times control). The surface soil sample collected in the spill containment area contained chromium (3 times control), vanadium (4 times control) and sulfate (7 times control). Zinc (40 times control) and sulfate (93 times control) were detected in the surface soil sample collected in the fuel maintenance area. Chromium (11 times control), lead (10 times control), zinc (14 times control), sulfate (219 times control) and sulfides (10 times control)

TABLE 3

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN NO. 0143

SUMMARY OF INORGANIC ANALYTICAL RESULTS SURFACE SOIL, SUBSURFACE SOIL, AND SEDIMENT SAMPLES

													SLUDGE LAGOON	
	CONTROL	LANDFILL EAST	WEST OF RIVER	LANDFILL WEST	SPILL CONTAINMENT AREA	FUEL MAINTENANCE	MANUFACTURING PLANT	CONTROL	LANDFILL EAST	WEST OF RIVER	LANDFILL WEST	SPILL CONTAINMENT AREA	EAST	WEST
PARAMETERS (mg/kg)	CN-SS-01	CN-SS-02	CN-SS-03	CN-SS-04	CN-SS-05	CN-SS-06	CN-SS-07	CN-SB-01	CN-SB-02	CN-SB-03	CN-SB-04	CN-SB-05	CN-SD-01	CN-SD-02
ALUMINUM	11,000	2,700	10,000	15,000	20,000	3,700	12,000	19,000	5,000	30,000	16,000	23,000	6,100	15,000
ARSENIC	3U	-	2.7	12	4.1	2.9	4.2	3.6	-	6.1	-	7.4	-	-
BARIUM	39	7	69	46	65	13	38	40	23	60	23	56	110	40
CADMIUM	0.70U	-	-	-	-	-	-	-	-	-	-	-	9.4	-
CALCIUM	150	290	-	1,800	310	140	1,700	130U	340	-	950	-	1,300	340
CHROMIUM	11	5.3	22	25	33	12	30	32	8.4	69	27	41	490	21
COBALT	3U	-	2.7	3.7	3.9	2.2	6.5	4.7	-	4.6	3.1	4.9	78	3.3
COPPER	4U	-	-	20	-	9.3	14	6.6	-	10	-	-	190	-
IRON	6,900	4,900	13,000	19,000	31,000	11,000	18,000	26,000	2,600	63,000	17,000	46,000	15,000	9,200
LEAD	14	4.1	10	180	14	17	140	11	4.3	17	6.1	14	86	7.3
MAGNESIUM	320	140	250	900	720	-	600	670	250	1,100	610	620	780	570
MANGANESE	170	14	62	120	18	41	46	15	24	24	32	13	350	190
MERCURY	0.12U	-	-	0.83	-	-	-	0.12U	-	-	0.83	-	9.6	-
NICKEL	5U	-	7	9.6	6.3	4.1	12	6.7	-	7.9	6.7	6.9	160	16
POTASSIUM	200	180	260	430	630	-	390	520	210	1,100	450	480	960	660
SODIUM	130U	-	-	-	180	-	570	130U	270	-	-	-	25,000	4,000
VANADIUM	17	8.4	28	36	68	7.1	24	54	8.1	83	34	72	-	22
ZINC	21	5.4	12	730	36	840	300	31	5.9	38	260	30	180,000	1,500
CYANIDE	2.9U	-	-	-	-	-	-	-	-	-	-	-	75	-
SULFATE	27	-	37	53	190	2,500	5,900	14U	12	20	84	12	460	1,700
SULFIDES	8.7	-	-	-	-	-	8,000	5.8U	180	-	210	-	370	9.3

- Material analyzed for but not detected above minimum quantitation limit (MQL).
U Material was analyzed for but not detected. The number given is the MQL.
R Quality Control indicates that data is unusable. Compound may or may not be present.

TABLE 4

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN NO. 0143

SUMMARY OF ORGANIC ANALYTICAL RESULTS SURFACE SOIL, SUBSURFACE SOIL, AND SEDIMENT SAMPLES

														SLUDGE LAGOON	
	SOIL TRIP BLANK	CONTROL	LANDFILL EAST	WEST OF RIVER	LANDFILL WEST	SPILL CONTAINMENT AREA	FUEL MAINTENANCE	MANUFACTURING PLANT	CONTROL	LANDFILL EAST	WEST OF RIVER	LANDFILL WEST	SPILL CONTAINMENT AREA	EAST	WEST
PARAMETERS (ug/kg)	CN-TB-015	CN-SS-01	CN-SS-02	CN-SS-03	CN-SS-04	CN-SS-05	CN-SS-06	CN-SS-07	CN-SB-01	CN-SB-02	CN-SB-03	CN-SB-04	CN-SB-05	CN-SD-01	CN-SD-02
PURGEABLE COMPOUNDS															
TOLUENE	-	120J	-	25	-	-	-	-	6U	-	-	-	9	36	6J
UNIDENTIFIED COMPOUNDS/NO. (1)						60J/1		40J/1					20J/1	200J/3	
DIMETHYL-CYCLOPROPANE (1)														40JN	
THIOPHENE (1)														30JN	
DIMETHYL-THIOPHENE (1)														40JN	
DIMETHYL-DISULFIDE (1)															20JN
EXTRACTABLE COMPOUNDS															
NAPHTHALENE	-	770U	-	-	180J	-	-	-	-	-	-	-	-	-	-
ACENAPHTHENE	-	770U	-	-	450J	-	-	-	-	-	-	-	-	-	-
DIBENZOFURAN	-	770U	-	-	220J	-	-	-	-	-	-	-	-	-	-
FLUORENE	-	770U	-	-	460J	-	-	-	-	-	-	-	-	-	-
PHENANTHRENE	-	770U	-	-	4,500	-	-	160J	-	-	-	-	-	-	-
ANTHRACENE	-	770U	-	-	680J	-	-	-	-	-	-	-	-	-	-
DI-N-BUTYLPHTHALATE	-	770U	-	-	150J	-	3,800	-	-	-	-	-	-	-	-
FLUORANTHENE	-	770U	-	-	3,000	-	280J	210J	-	-	-	-	-	-	-
PYRENE	-	770U	-	-	3,200	-	180J	-	-	-	-	-	-	-	-

-	Material analyzed for but not detected above minimum quantitation limit (MQL).
J	Estimated Value.
N	Presumptive evidence of presence of material.
U	Material was analyzed for but not detected. The number given is the MQL.
(1)	Tentatively identified and unidentified compounds. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.

TABLE 4, Continued

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN NO. 0143

SUMMARY OF ORGANIC ANALYTICAL RESULTS
SURFACE SOIL, SUBSURFACE SOIL AND SEDIMENT SAMPLES

														SLUDGE LAGOON	
	SOIL TRIP BLANK	CONTROL	LANDFILL EAST	WEST OF RIVER	LANDFILL WEST	SPILL CONTAINMENT AREA	FUEL MAINTENANCE	MANUFACTURING PLANT	CONTROL	LANDFILL EAST	WEST OF RIVER	LANDFILL WEST	SPILL CONTAIN -MENT AREA	EAST	WEST
PARAMETERS (ug/kg)	CN-TB-015	CN-SS-01	CN-SS-02	CN-SS-03	CN-SS-04	CN-SS-05	CN-SS-06	CN-SS-07	CN-SB-01	CN-SB-02	CN-SB-03	CN-SB-04	CN-SB-05	CN-SD-01	CN-SD-02
BENZO(A)ANTHRACENE	-	770U	-	-	1,900	-	-	-	-	-	-	-	-	-	-
CHRYSENE	-	770U	-	-	1,600	-	-	-	-	-	-	-	-	-	-
BENZO(B AND/OR K) FLUORANTHENE	-	770U	-	-	1,900	-	-	-	-	-	-	-	-	-	-
BIS(2-ETHYLHEXYL)PHTHALATE	-	770U	-	-	960	-	-	-	-	-	-	-	-	-	-
BENZO(A)PYRENE	-	770U	-	-	850	-	-	-	-	-	-	-	-	-	-
INDENO(1,2,3-CD)PYRENE	-	770U	-	-	630J	-	-	-	-	-	-	-	-	-	-
BENZO(GHI)PERYLENE	-	770U	-	-	170J	-	-	-	-	-	-	-	-	-	-
GAMMA SITOSTEROL (1)		2,000JN													
METHOXY-FRIEDOOLEANENE (1)				3,000JN											
BENZOFLUORANTHENE (NOT B OR K) (1)					1,000JNJ										
EPOXY-B-FRIEDOSECOPENE (1)					4,000JN										
HEXADECANE (1)														10,000JN	
HEPTADECANE (1)														10,000JN	
TETRA-METHYLBUTYLPHENOL (1)														8,000JN	
UNIDENTIFIED COMPOUNDS/ NO. (1)		30,000J/11		600J/1	70,000J/4		3,000J/2	4,000J/2	2,000J/2					9,000,000 J/1	30,000J /14
PESTICIDE/PCB COMPOUNDS															
PCB-1260 (AROCLOR 1260)	-	370U	-	-	1,100	-	-	-	-	-	-	-	-	-	-

-	Material analyzed for but not detected above minimum quantitation limit (MQL).
J	Estimated Value.
N	Presumptive evidence of presence of material.
U	Material was analyzed for but not detected. The number given is the MQL.
(1)	Tentatively identified and unidentified compounds. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.

TABLE 5

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN NO. 0143

SUMMARY OF INORGANIC ANALYTICAL RESULTS
GROUNDWATER SAMPLES

	PRESERVATIVE BLANK	POTABLE WELL CONTROL	ONSITE INDUSTRIAL WELLS				
PARAMETERS (ug/l)	CN-PB-01	CN-PW-01	CN-IW-01	CN-IW-02	CN-IW-03	CN-IW-04	CN-IW-05
BARIUM	-	25	58	32	27	39	64
CALCIUM	-	610	1,300	2,100	1,100	1,900	3,600
COBALT	-	8U	-	-	-	12	-
COPPER	-	5U	-	-	-	-	31
IRON	-	80U	-	890	-	670	-
MAGNESIUM	-	600U	1,200	1,100	680	1,000	1,700
MANGANESE	-	30	41	59	47	110	46
POTASSIUM	-	720U	770	-	-	-	1,000
SODIUM	-	2,600	20,000	17,000	4,300	19,000	17,000
ZINC	-	6U	-	19	14	78	67
SULFATE	-	1,000UR	20,000J	27,000J	-	34,000J	19,000J
SULFIDES	-	1,400J	-	-	4,000J	14,000J	3,600J

-	Material analyzed for but not detected above minimum quantitation (MQL).
J	Estimated Value.
U	Material was analyzed for but not detected. The number given is the MQL.
R	Quality Control indicates that data is unusable. Compound may or may not be present.

TABLE 6

TES VIII WORK ASSIGNMENT NO. C04123
FINAL SITE INSPECTION REPORT
COURTAULDS FIBERS, INC.
LEMOYNE, MOBILE COUNTY, ALABAMA
EPA ID NO. ALD008150617
WASTELAN NO. 0143

SUMMARY OF ORGANIC ANALYTICAL RESULTS
GROUNDWATER SAMPLES

	TRIP BANK	POTABLE WELL CONTROL	ONSITE INDUSTRIAL WELLS				
PARAMETERS (ug/l)	CN-TB-01W	CN-PW-01	CN-IW-01	CN-IW-02	CN-IW-03	CN-IW-04	CN-IW-05
PURGEABLE COMPOUNDS							
CARBON TETRACHLORIDE	-	5U	-	-	3J	-	-
TRICHLOROETHENE	-	5U	-	-	4J	-	-

- Material analyzed for but not detected above minimum quantitation (MQL).
J Estimated Value.
U Material was analyzed for but not detected. The number given is the MQL.

were detected in the surface soil sample collected near the manufacturing plant. The only subsurface soil samples that contained elevated concentrations of inorganic contaminants were the two samples collected in the nonhazardous waste landfill. Elevated concentrations of mercury (7 times control), zinc (8 times control), sulfate (6 times control) and sulfide (36 times control) were detected in the surface soil collected from the western portion of the landfill, while only sulfides (36 times control) was detected in the subsurface soil sample collected from the eastern portion of the landfill.

Of the inorganic contaminants detected at elevated concentrations in soil samples zinc, sulfate and sulfides are related to the viscose process.

Only two surface soil samples contained elevated concentrations of organic contaminants (concentrations greater than MQL), while three samples contained estimated quantities of organic contaminants. Fourteen polynuclear aromatic hydrocarbons (PAHs), 2 phthalates and Aroclor 1260 (polychlorinated biphenyl [PCB]) were detected in the surface soil sample collected in the eastern portion of the nonhazardous waste landfill. The surface soil sample collected in the fuel maintenance area contained three identified organic compounds and the surface soil sample collected in the manufacturing area contained two identified organic compounds. Both samples contained two PAH compounds. The organic contaminants that were detected in these soil samples are compounds commonly found in either petroleum products or plasticizers.

The sludge lagoons also contained inorganic contaminants. A control sediment sample was not collected as these two sediment samples were considered representative of waste. The following contaminants were present: barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, and zinc. Sulfate and sulfide were also detected. Toluene (36 micrograms/kilograms [μg/kg] and 6 μg/kg) along with five miscellaneous compounds detected at estimated concentrations were the only organic contaminants detected in the sludge lagoon samples. The eastern lagoon in general contained more contaminants at higher levels than the western lagoon.

4.2.3.2 Groundwater Sampling Results

Each of the groundwater samples which were collected from four process wells contained at least one of the contaminants associated with the viscose process (zinc, sulfate or sulfide) at elevated concentrations. The process well sample collected southwest of the sludge lagoons contained zinc (13 times MQL), sulfide (10 times control) and sulfate (34 times MQL), while the process well sample collected southeast of the sludge lagoons contained zinc (3 times MQL) and sulfate (27 times MQL). The process well on the northeast corner of the sludge lagoons contained zinc (11 times MQL) and sulfate (19 times MQL). Sulfate (20 times MQL) was detected in the process well sample collected on the northern border of the property, north of the sludge lagoons.

Additionally, manganese (4 times control) was detected in one process well.

Organic compounds were not detected at elevated concentrations in any of the groundwater samples.

5.0 SUMMARY

Surface soil, subsurface soil, sediment and groundwater samples collected during the SI contained elevated concentrations of inorganic contaminants. Elevated concentrations of at least one of the contaminants associated with the viscose process (zinc, sulfide or sulfate) were detected in four surface soil, two subsurface soil, two sediment and four groundwater samples. Other inorganic contaminants detected at elevated concentrations in at least one surface soil sample include the following: arsenic, copper, chromium, lead, mercury and vanadium. Additionally, sediment samples collected from the sludge lagoons contained the following inorganic contaminants: barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury and nickel. Toluene was also detected in the sludge lagoon sediment samples. Three surface soil samples contained organic compounds such as PAHs, phthalates or Aroclor 1260. The areas of greatest contamination were the sludge lagoons and the nonhazardous waste landfill.

These contaminants can be transported along the surface water migration pathway through wetlands located on the western bank of the Mobile River and then into the river itself to complete the 15-mile surface water migration pathway. Fishing is conducted in the Mobile River. Additionally, there are endangered or threatened species living in either the river or the wetlands areas surrounding the Mobile River.

Potable water for the study area is obtained from either private or municipal wells located within a 4-mile radius of the facility. Site-related contaminants have been documented at elevated levels in onsite groundwater wells.

Based on the presence of site-related contaminants in groundwater, and the potable use of groundwater in the vicinity of the site, it is recommended that this site be considered for further action under CERCLA.

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REFERENCE 4

Document No. 6370-002

Endangerment Assessment Report Cold Creek/LeMoyne Site, Mobile County, Alabama

Prepared for:

Akzo Chemicals, Inc.
Chicago, IL

ICI Americas
Wilmington, DE

May 1988

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Introduction

The Endangerment Assessment for the Cold Creek/LeMoyne site is based on existing data from the Remedial Investigation and other information provided to ERT by Stauffer Chemical Company. The development of this Endangerment Assessment (EA) is consistent with the requirements of the National Contingency Plan (NCP), and conforms to EPA guidance regarding EAs at CERCLA sites.

Site Description and History

Stauffer Chemical Company previously owned and operated a multi-product inorganic chemical manufacturing plant at LeMoyne, Alabama and an agricultural chemical facility at the adjacent Cold Creek site. The LeMoyne plant, purchased by Akzo Chemie America, Inc. (now Akzo Chemicals Inc.) in 1987, has been in operation since 1953. The Cold Creek plant has been in operation since 1966 and is currently owned by ICI Americas, Inc.

Halby Chemical Company (later part of Witco, Inc.) also operated a small facility for a time on a leased section of the LeMoyne property.

Until 1973, industrial wastes from these operations were disposed in unlined disposal areas and, in the case of wastewater, to unlined ponds or, after treatment, by discharge to Cold Creek swamp. Presumably as a result of these practices, a ground-water contamination problem developed. This was recognized in the early 1970's, and many improvements and waste-handling modifications were made, including the installation of a ground-water intercept and treatment system.

In 1982, an assessment of the plant sites was made by the Alabama Department of Public Health in response to submissions made by Stauffer to the House Committee on Interstate Commerce ("the Eckhardt Survey"). At the request of the Alabama Department of Public Health, monitoring wells were installed around the three closed landfills. In spite of the previously identified ground-water problems already under remediation, data primarily from these monitoring wells were held by the Federal Environmental Protection Agency (EPA) to be the basis for inclusion of these facilities on the National Priorities List (NPL), which ranks hazardous waste disposal sites under provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), commonly known as "Superfund".

Extent of Contamination

To properly assess the potential public health and environmental impacts from the Cold Creek/LeMoyne site, a characterization of the potential areas of contamination must be made. These include the nine ponds or lagoons, four of which are still active, the three closed landfills, and portions of the two swamps (Cold Creek and LeMoyne).

Based on the frequency of detection, the concentrations detected, and the toxicological properties of the contaminants which have been found at the site, the following compounds were selected as "representative" compounds. These are:

- carbon tetrachloride;
- carbon disulfide;
- cyanide;
- mercury;
- 6 thiocarbamates (including EPTC, butylate, cycloate, molinate, pebulate, and vernolate); and
- thiocyanate.

Exposure Assessment

The Cold Creek/LeMoyne site is located in an industrial area and is surrounded by several other large chemical production companies. Fewer than 10 residences are located within one mile of the site, and none of them are downgradient of the contaminated ground water at the site. The nearest population centers include Mt. Vernon (with a population of 1,038), which is located about 8 miles north of the site, and Creola (population of 673), which is located about 5 miles to the south (U.S. Department of Commerce, 1981).

The majority of the chemical plants as well as the local communities in the area obtain water from the water-table aquifer. The Cold Creek facility has one drinking-water well and one backup well, and the LeMoyne facility has two drinking-water wells. The CNA facility to the south has one drinking-water well and a backup well. These wells were sampled during the RI, and no contaminants were detected.

Both Cold Creek swamp and LeMoyne swamp represent the most important environmental receptors at the site. These swamps currently support a diverse variety of plants and animals, including the alligator, which is currently listed as a threatened species. The Mobile River, which forms the eastern boundary of the site, is also a potential environmental receptor.

After identifying the potential receptors and the contaminants to which they may be exposed, it is necessary to determine the ways in which they may be exposed and the frequency and magnitude of the potential exposure. Human exposure to the contaminants identified at the Cold Creek/LeMoyne site can potentially occur directly through air, water or solid media (soils, sediments or sludges) or indirectly through the food chain; however, the most likely exposure pathways are as follows:

- Incidental ingestion of contaminated swamp sediments;
- dermal contact with contaminated swamp sediments;
- ingestion of contaminated biota; and,
- ingestion of contaminated ground water.

Exposure to contaminated swamp sediments and via ingestion of fish is probably infrequent because the site is located in an industrial area and people generally do not spend much time in wetland areas unless they are bird watchers or are on other kinds of nature walks. In addition, shoes and other articles of clothing will help to protect anyone from direct contact with the swamp sediments. Ingestion of contaminated fish is also expected to be infrequent because it is unlikely that anyone fishes in Cold Creek swamp, given its proximity to industrial property, its restricted access, and the small size of the fish in the swamp.

No current risk appears to exist from exposure to contaminated ground water at the site, because none of the contaminants have been detected in any of the drinking-water wells in the immediate vicinity of the site. It is highly unlikely that future exposure to contaminated ground water would occur, because a permit is required for the installation of a potable water well from the state of Alabama, and it is unlikely that a permit would be granted given the documented ground-water contamination at the site.

Public Health Risk Characterization

Quantitative risk estimates were conducted for both adult workers and teenagers that could be exposed to contaminants at the Cold Creek/LeMoyne site. Using conservative assumptions, risks were calculated for hypothetical individuals who may come in contact with hazardous compounds via exposure to contaminated swamp sediments and ingestion of contaminated fish and ground water. Two scenarios were developed for each exposure route. The worst-case scenario assumes that an individual is exposed to the maximum concentration of the compound measured in that media (i.e., sediments or fish), and the realistic case uses average concentrations found at the site. For teenagers, it was assumed that they would be exposed to contaminated swamp sediments 6 times per year for a period of 5 years, and for adult workers it was assumed that they be exposed 12 times per year (once a month) for 30 years. In determining risk from ingestion of contaminated fish, it was assumed that an individual would consume 26 grams of fish per day for a period of 30 years.

Results of the quantitative risk assessment for noncarcinogens show that individuals exposed to contaminants at the Cold Creek/LeMoyne site are not at risk, even if they are exposed to maximum concentrations under current conditions. Even when the risks for each exposure route and each compound are summed, the total Hazard Index (HI) is still less than unity, showing that the estimated doses are less than the threshold doses (i.e., the dose below which no adverse effects are expected to occur). However, care must be taken when interpreting summed HI's, because adding them assumes that their toxicological effects are additive, which may not be true.

The underlying assumption for assessing the risks from suspect or known human carcinogens is that there is no threshold for an adverse health effect. Carcinogenic risk is quantified by multiplying an EPA-derived cancer potency factor by the estimated intake (dose) to calculate cancer risk due to each site-related exposure. Carbon tetrachloride is the only indicator compound at the Cold Creek/LeMoyne site which is considered by the EPA to be a suspect human carcinogen. This compound was only detected in the ground water and in subsurface soil samples from beneath the wastewater treatment ponds. As discussed above, there is no current risk from exposure to contaminated ground water, and therefore, there is no current risk from carbon tetrachloride at this site. However, carcinogenic risk from carbon tetrachloride ranges from 3.57×10^{-4} to 5.28×10^{-5} should a worker ingest contaminated ground water in the future for a period of thirty years, which is highly unlikely.

Environmental Impacts

The most environmentally sensitive portion of the site is believed to be the Cold Creek swamp. Sediment concentrations and fish body burdens of mercury appears to be elevated in this area. Potential exposure routes for aquatic and semi-aquatic organisms include water, sediment and food-chain pathways, with the food-chain exposure route predominating at higher trophic levels. The U.S. Fish and Wildlife Service (USFWS) considers the swamp to be a preferred habitat for the threatened American alligator (Alligator mississippiensis), and the potentially endangered Alabama Red-Bellied turtle (Pseudemys alabamensis).

Current data are not adequate to assess the exposed biota populations or estimate exposure via all pathways and thus to estimate potential risks to these populations. With the data at hand, the potential for adverse affects to sensitive birds and mammals, if these inhabit the wetland, cannot be ruled out.

REFERENCE 5

Site Review And Update

STAUFFER CHEMICAL COMPANY (COLD CREEK PLANT)

BUCKS, MOBILE COUNTY, ALABAMA

CERCLIS NO. ALD095688875

AND

STAUFFER CHEMICAL COMPANY (LEMOYNE PLANT)

LE MOYNE, MOBILE COUNTY, ALABAMA

CERCLIS NO. ALD008161176

MARCH 21, 1994

REVISED

JUNE 17, 1994

JUL 1994
ADEM
SPECIAL PROJECTS

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Site Review and Update: A Note of Explanation

The purpose of the Site Review and Update is to discuss the current status of a hazardous waste site and to identify future ATSDR activities planned for the site. The SRU is generally reserved to update activities for those sites for which public health assessments have been previously prepared (it is not intended to be an addendum to a public health assessment). The SRU, in conjunction with the ATSDR Site Ranking Scheme, will be used to determine relative priorities for future ATSDR public health actions.

REVISED SITE REVIEW AND UPDATE

STAUFFER CHEMICAL COMPANY (COLD CREEK PLANT)

BUCKS, MOBILE COUNTY, ALABAMA

CERCLIS NO. ALD095688875

AND

STAUFFER CHEMICAL COMPANY (LEMOYNE PLANT)

LE MOYNE, MOBILE COUNTY, ALABAMA

CERCLIS NO. ALD008161176

Prepared by

Alabama Department of Public Health
Under a Cooperative Agreement With
Agency for Toxic Substances and Disease Registry

SUMMARY OF BACKGROUND AND HISTORY

The Cold Creek and LeMoyne Superfund Sites (the sites) are located approximately 20 miles north of Mobile, Mobile County, Alabama in the rural community of Axis (Figure 1).[1] Land use surrounding the sites is predominately industrial (Figure 2). The Alabama Power Barry Steam Generating Plant, a coal-fired, electrical generating station, is located north, Hoechst Celanese Corporation is northwest, and ATOCHEM is west of the sites. Other nearby chemical production facilities include Courtauld Fibers, Inc., and DuPont, Inc. The Cold Creek Swamp begins north-northeast of the sites, and continues to the Mobile River, about one and one-half miles to the east.[1] The swamp encloses about 650 acres. Cold Creek passes through the swamp and flows into the Mobile River.

The Stauffer Chemical Company once owned both plants, which together comprise 947 acres. Zeneca (formerly ICI Americas, Inc.) currently owns the Cold Creek Plant, and Akzo Chemical, Inc. owns the LeMoyne Plant. The companies maintain active production plants on the property, and share responsibility for the sites. The sites are being studied and cleaned-up together.[2] Under Stauffer Chemical Company ownership, the LeMoyne plant began operations in 1953 with a retort carbon disulfide (CS_2) plant. Other production facilities were added later, including a reactor CS_2 plant (1956), a sulfuric acid plant (1957), a carbon tetrachloride (CTC) plant (1963), a caustic/chlorine plant (1964), and Crystex (a proprietary sulfur compound) plant (1974). Halby Chemical Company (later part of Witco, Inc.) operated a plant on a leased section of the LeMoyne property from approximately 1965 to 1979. The LeMoyne plant was acquired by Akzo Chemie America (now Akzo Chemicals, Inc.) in 1987. The Cold Creek plant began operations in 1966 and expanded its operations to include production of a variety of agricultural chemicals, including several thiocarbamates. Zeneca now owns the Cold Creek plant.[1]

Past wastewater disposal practices at the Stauffer plants resulted in the contamination of the on-site soils with thiocarbamates and thiocyanate; the groundwater with carbon tetrachloride, carbon disulfide, and thiocarbamates; and swamp sediment and fish with mercury.[2] The sites have been divided into three operable units (OUs): the 18 solid waste management units (SWMUs) (Figure 3), the groundwater, and the Cold Creek Swamp.

Wastewaters from the Cold Creek and LeMoyne plants and the Halby Chemical Company were discharged into Cold Creek Swamp. In 1975, an effluent line was constructed to allow discharge of processed wastewater directly into the Mobile River. The swamp no longer receives effluent discharge.[1]

On-site contaminant source clean-up activities were started in late 1973. Three intercept wells and an air stripping system were installed in late 1980 to contain groundwater contamination. The wells were approved by the Alabama Water Improvement Commission, now the Alabama Department of Environmental Management (ADEM).[3]

In 1982, the Alabama Department of Public Health (ADPH) and the U.S. Environmental Protection Agency (EPA) investigated the site. Metals, chlorides, carbon tetrachloride, and assorted organic compounds were detected. As a result, the EPA added the Cold Creek and LeMoyne sites to the National Priorities List (NPL). The Cold Creek site was ranked number 204 and the LeMoyne site was ranked number 467.[3] The Remedial Investigation/Feasibility Study (RI/FS) was submitted to the EPA in 1988.

The Public Health Assessment (PHA) for the Cold Creek and LeMoyne sites was completed in January 1989.[2] No contaminants of concern were found off-site at concentrations high enough to cause adverse health effects. The PHA did find that mercury was present in swamp sediments and fish at levels that could cause adverse health effects in exposed people. Trespassers in the swamp, including children, were cited as a population that might be exposed to mercury contaminated swamp sediments through incidental ingestion, inhalation, or dermal contact. The main potential human exposure pathway was through eating mercury contaminated fish, but the data were insufficient to judge whether exposure had occurred. The PHA classified the sites a potential health concern, and made the following recommendations.

1. The contaminated groundwater should continue to be withdrawn and treated.
2. Restricted access to the Cold Creek Swamp should be continued.
3. Consideration should be given to determining the extent of mercury contamination in the Cold Creek Swamp and Mobile River. In order to delineate the mercury contamination, a methodical sampling plan should be developed and implemented. This plan should determine the total extent of mercury sediment and fish contamination.
4. In order to more adequately assess human exposure, information on the recreational use of the creeks, river, and land near the sites should be obtained.
5. Additional sampling of consumable fish from the Cold Creek Swamp is warranted. This measure would facilitate assessment of human exposure to mercury contaminated fish.
6. Groundwater monitoring should be continued to ensure that the groundwater interception system is preventing the migration of contaminants of concern.

CURRENT CONDITIONS OF THE SITE

Brian Hughes, PhD, Environmental Toxicologist and Janice Gilliland, MSPH, Epidemiologist, from the ADPH, visited the sites on August 12, 1993. Public access to the active plant areas is restricted by a chain-linked fence. Much of the property outside the active plant areas is grass covered. The Cold Creek Swamp can be entered from the Mobile River and by crossing through Alabama Power property on the north or Courtauld Fibers, Inc. property to the south. No physical hazards were noted during the visit.

The final Decision Document for the SWMUs at the Stauffer Cold Creek/LeMoyne sites (completed in December 1992[4]) presented evidence that the Cold Creek Old Neutralization Pond, the LeMoyne Landfill, and the Old Carbon Tetrachloride Plant wastewater treatment (WWT) pond/Old Carbon Disulfide Plant WWT pond, and possibly the Old Halby Pond, may have leached contaminants of concern into the groundwater. Contaminants of concern detected in the groundwater and reported in the Decision Document for the SWMUs (OU-2) were thiocarbamates, carbon tetrachloride, carbon disulfide, and thiocyanate. Apparently, on-site groundwater contamination is being contained by the pump and strip treatment wells, and is not an exposure pathway of concern at this time.

The Old Firewater pond and the Unnamed Tributary are on-site units that present ecological concerns. The Decision Document recommends that a focussed study be conducted on each of these units to identify potential chemicals of concern and as a preliminary evaluation of ecological risk.[4] There is no known completed human exposure pathway.

The EPA is working with Zeneca and Akzo Chemicals, Inc. to identify further the nature and extent of contaminants related to the SWMUs on the sites. At present, we believe that a potential exposure pathway exists for remediation workers only.

Mercury contamination in the sediments and biota in the Cold Creek Swamp is a past and present health concern associated with the site. The Remedial Investigation (RI) Report on the Cold Creek Swamp Operable Unit, released in March 1992, documents the extent of mercury contamination in the swamp. Sampling for the Cold Creek Swamp RI was conducted in three phases, designated Stage I, Stage II, and Stage III. Stage I sampling confirmed mercury as the primary contaminant of concern in swamp soils and sediments.[3] Because the potential for human exposure to mercury in sediments lessens with greater depth, we limited our assessment to mercury levels in the top 12 inches of sediments.

The highest mercury concentrations are found in the Upper Swamp zone, and generally decrease as distance from the source increases. Mercury was found at a maximum concentration of 1600 mg/kg (estimated value) in Stage II D core samples taken from the top 12 inches of sediment in the upper swamp. Concentrations in the D samples from the same depth decreased in the lower swamp to a maximum level of 55.1 mg/kg (estimated value).

Some samples were collected to determine the bioaccessibility of the mercury in the swamp. Samples taken at the 0 - 4 inch depth (B samples) in the middle swamp revealed concentrations of total mercury up to 632 mg/kg (estimated value, Sample B-29), and 470 micrograms per kilogram of methyl mercury (B-34).

The Stage III sampling provided an assessment of mercury contamination in the swamp biota. Analyses were based on whole body samples from finfish, herptiles and invertebrates. Only the results from the finfish samples are discussed here.

Ten finfish were collected from each of the three swamp zones (upper, middle and lower). Specimens ranged in size from 101 to 600 millimeters in length. The species and the number of fish per species sampled varied among the swamp zones. Total mercury ranged from a low of 0.14 mg/kg in a bluegill from the upper zone, to a high of 3.5 mg/kg in a chain pickerel in the lower swamp.

On May 11, 1992, the Mobile County Health Department issued a no consumption advisory for fish caught in the Cold Creek Swamp. The advisory was issued because the mercury concentrations in many fish samples exceeded the Food and Drug Administration action level of one part per million or one mg/kg, and the fish were from an area accessible to the Mobile River. The fish advisory is still in effect.

The EPA issued a Record of Decision (ROD) in October 1993 documenting the selected clean-up plan for the Cold Creek Swamp. The ROD recommends the upper arm swamp zone (Figure 4) be capped with a multi-layer cover consisting of different materials to reduce exposure to and movement of the contamination. Barriers will be created to isolate the upper arm from the rest of the swamp. A intermittent creek that runs through the upper arm swamp zone will be diverted. The upper arm swamp zone will be monitored for 10 years.

Parts of the swamp middle/lower transition zone (Figure 4) where mercury levels exceed remedy performance standards will be excavated to a depth of two feet. The excavated material will be hauled to the upper arm swamp zone and placed under the multilayer cap. The remedies selected for the Cold Creek Swamp meet all necessary Federal and State requirements. The EPA will perform the remedial design.

CURRENT ISSUES

Mercury contamination is still present in swamp sediments and fish. Long-term mercury exposure can cause permanent damage to the brain, kidneys and developing fetuses.[6] People trespass in the swamp and may be exposed to mercury through incidental ingestion, inhalation or dermal contact. The exposure pathway of most concern, however, is through ingestion of mercury contaminated fish from Cold Creek and the Cold Creek Swamp.

Surprisingly, fish from the lower swamp zone have the highest whole body tissue levels of total mercury. In the lower zone, seven of ten fish had concentrations of total mercury at or above 1 mg/kg. Five of the ten specimens sampled were chain or redfin pickerel, and four of these had mercury levels above 1 mg/kg. The highest mercury level reported in fish was 3.5 mg/kg, found in a chain pickerel in the lower swamp zone. Four of ten fish sampled in the middle zone had total mercury levels above 1 mg/kg. Of the four with elevated mercury levels, two were chain pickerel and two were largemouth bass. Only one of ten specimens in the upper zone had a total mercury level at or above 1 mg/kg. No pickerel were included in this sample; however three of the ten fish were largemouth bass, none of which had mercury levels above the FDA action level. The observed variation in mercury levels among the three swamp zones may be a result of differences in species and number of fish per species that were sampled from each area.

A public availability meeting (PAM) held on July 24, 1993 to determine community health concerns about the sites. The PAM was well attended, but most people had no site-related complaints and wanted to discuss concerns about other nearby industries. Some people expressed health concerns regarding the safety of private groundwater wells and the local municipal water supply. A few local residents still use shallow domestic wells for drinking water. Several people also mentioned that they no longer eat locally caught fish or game for fear of contamination.

CONCLUSIONS

Past manufacturing practices at the Cold Creek and LeMoyne Superfund sites resulted in contamination of the groundwater, on-site soils and the Cold Creek Swamp. There is no known past or present exposure to contaminated groundwater. The corrective action wells appear to have restricted groundwater contamination to the sites. The SWMUs in the active plant areas have been or are being remediated, and do not present a potential exposure pathway to off-site populations. Trespassers may be exposed to mercury through incidental ingestion, inhalation or skin absorption from contaminated sediments in the Cold Creek Swamp. The EPA has selected a cleanup remedy for the Cold Creek Swamp, but the ROD has not been implemented.

The primary exposure pathway of concern at the sites is from eating mercury contaminated fish from the swamp. Whole body analyses of fish samples from the site show that mercury is being bioaccumulated at concentrations above the FDA action levels (one part per million). It is important to note that mercury levels in the edible portions of fish would be higher than levels from whole body analysis. However, we do not know if exposure is occurring. The swamp and creek are on privately owned industrial property and public access is restricted. In addition, a no consumption fish advisory is in effect for Cold Creek Swamp. For these reasons, we do not believe that consumption of fish from Cold Creek Swamp is a completed exposure pathway of concern at this time. However, if people are eating fish from the swamp, we will need to reassess the situation.

Several recommendations in the 1989 PHA were followed, including continuing monitoring and treatment of the groundwater, continuing to restrict access to Cold Creek Swamp, determining the extent of mercury contamination in the swamp, and additional sampling of fish from the swamp. The PHA recommended additional studies of the extent of contamination in the Mobile River. An EPA study of the Tombigbee and Mobile Rivers is now underway. The sites will need to be reevaluated when data from that study become available.

RECOMMENDATIONS

Recommendations from the previous PHA that generally remain valid are listed below.

1. The contaminated groundwater should continue to be treated and monitored.
2. Access to Cold Creek Swamp should continue to be restricted to prevent incidental exposure to mercury contaminated swamp sediments.
3. Information on the recreational use of local creeks, the river, and land near the sites is needed to better assess possible human exposure.

In addition, the ADPH recommends that the no fish consumption advisory on Cold Creek Swamp be continued until the contamination of mercury in fish tissue decreases to acceptable levels. When data from the Tombigbee/Mobile River study become available, the sites should be reevaluated to learn whether surface water, sediments or fish are possible human exposure pathways to contaminants of concern.

Health Activities Recommendation Panel Recommendations:

The data and information developed in the Site Review and Update have been evaluated to determine if follow-up actions may be indicated. Further site evaluation is needed to determine appropriate public health actions.

REFERENCES CITED

1. EA Engineering, Science, and Technology, Inc. Remedial Investigation Report, Cold Creek Swamp Operable Unit, Cold Creek/LeMoyne Superfund Sites, Mobile, Alabama, Volume 1. Draft. March 1992.
2. Health Assessment for Stauffer Chemical Company National Priorities List (NPL) Sites, Mobile, Alabama. January 6, 1989.
3. Remedial Investigation Report for the Cold Creek/LeMoyne Site Mobile County, Alabama. Final Report. May 1988.
4. EA Engineering, Science, and Technology, Inc. Decision Document Stauffer Cold Creek/LeMoyne Sites: Solid Waste Management Units (SWMUs) Evaluation, Operable Unit No. 2. Final. December 1992.
5. Mobile County Health Department. News Release. May 11, 1992.
6. Agency for Toxic Substances and Disease Registry. toxicological profile for mercury. Atlanta: ATSDR, February 1993.

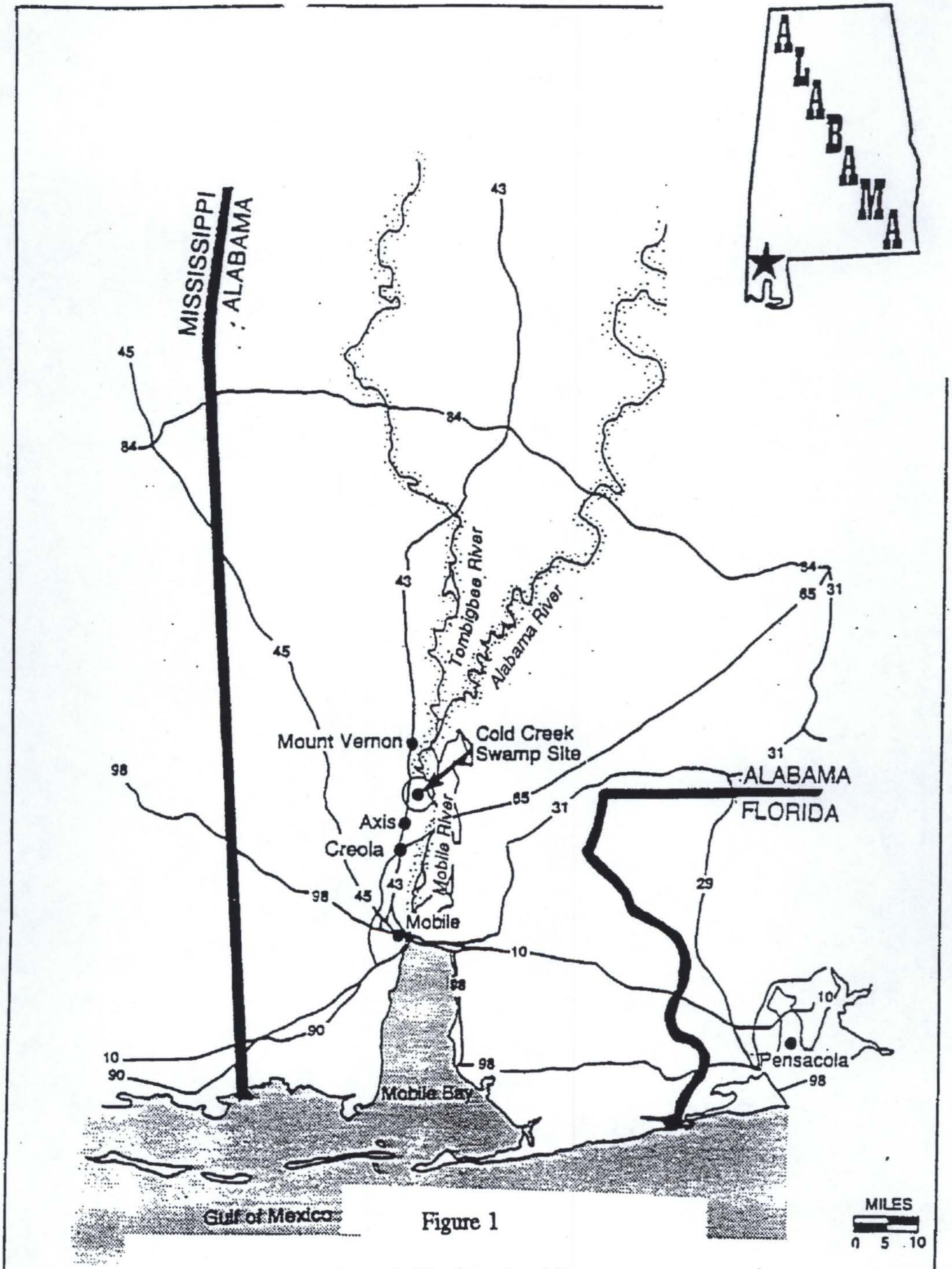


Figure 1

Area & Site Location Map

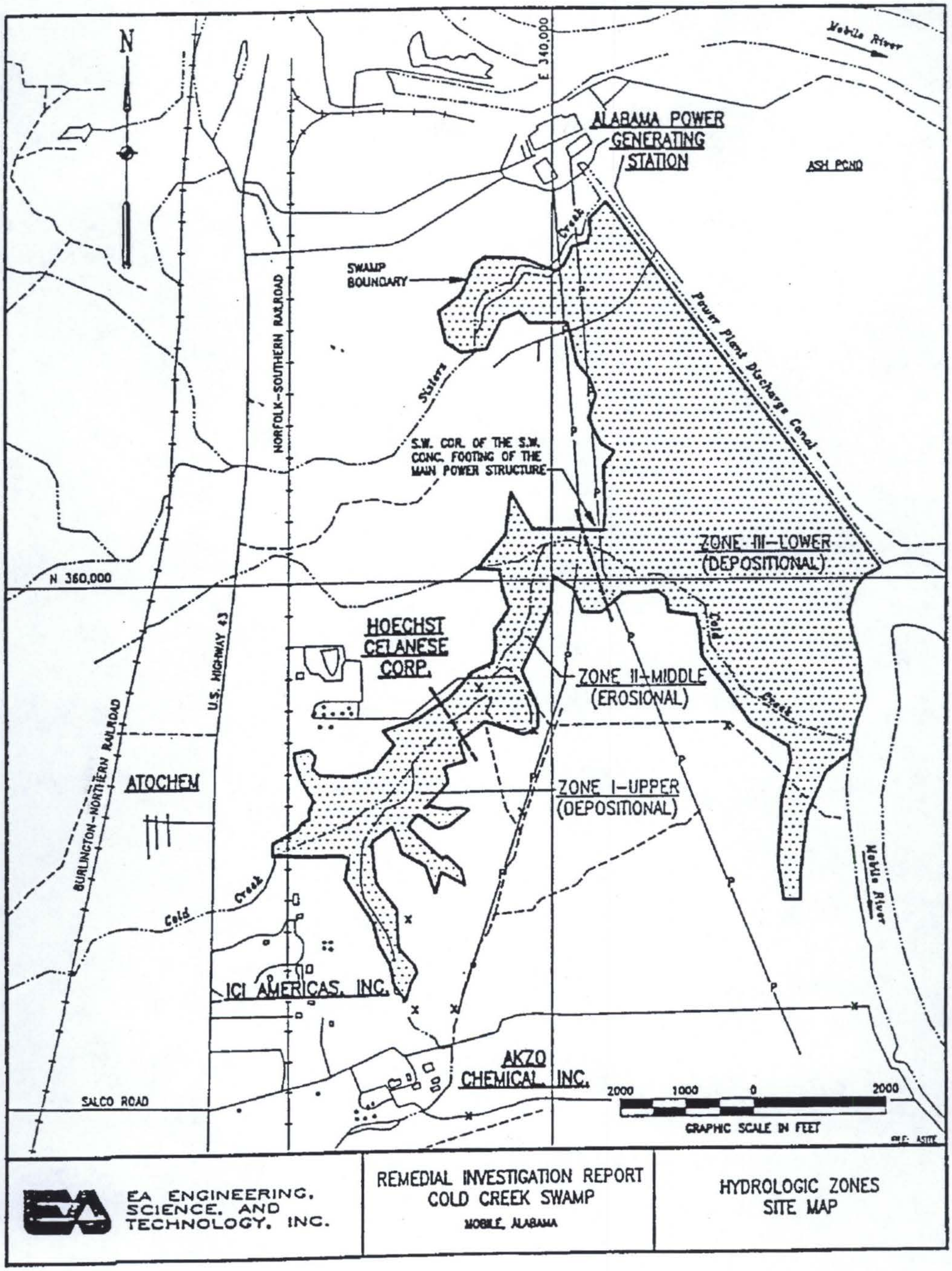
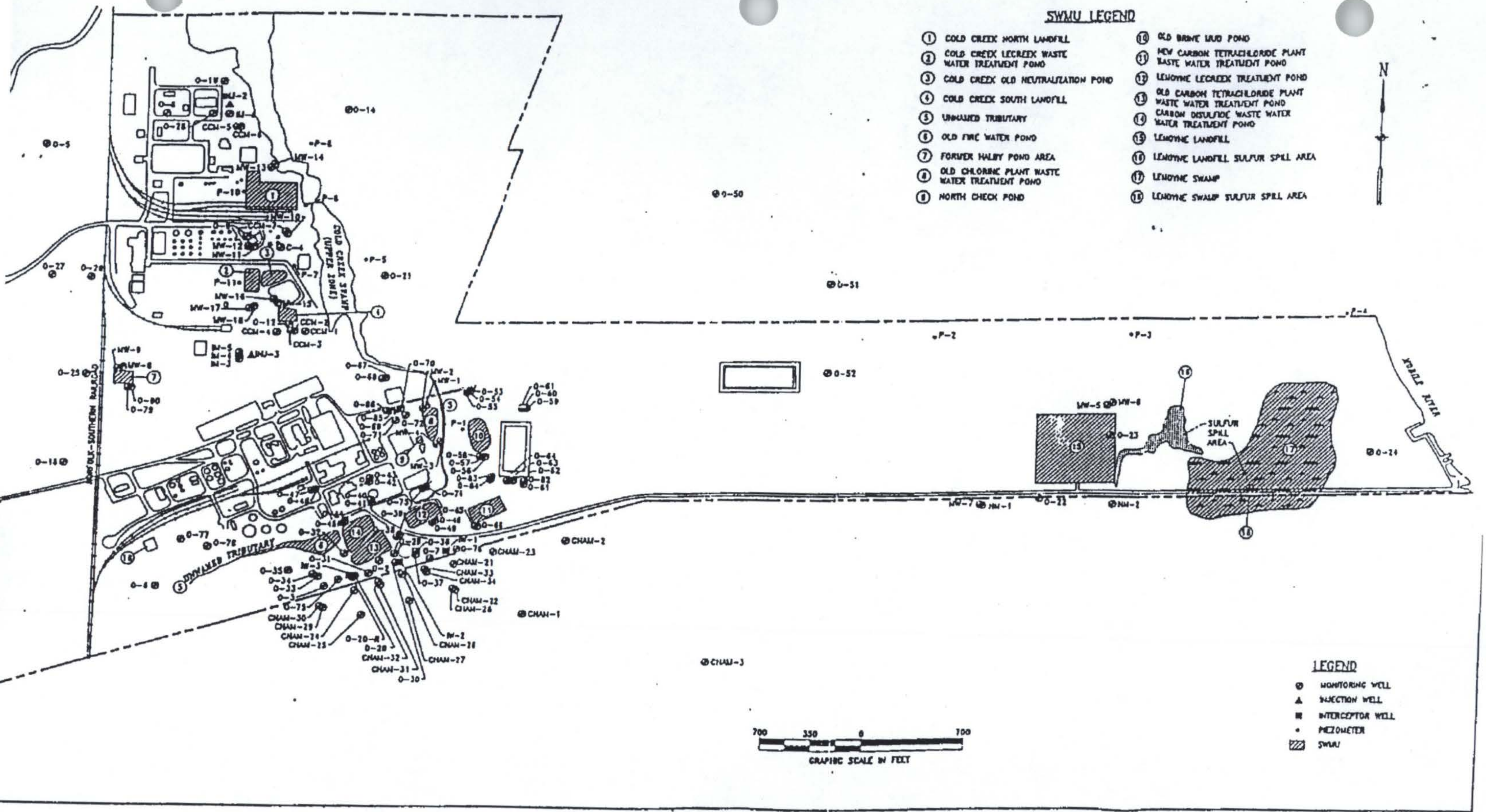


Figure 2

Cold Creek Swamp



EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

OPERABLE UNIT 2
MOBILE, ALABAMA

STAUFFER COLD CREEK/
LEMOYNE SITES
SOLID WASTE MANAGEMENT SITES (SWMUs)

DESIGNED BY	DRAWN BY	DATE	PROJECT NO.	FILE NAME
PWK	MSM	11-10-92	11653.20	GM-B1
CHECKED BY	PROJECT MGR.	SCALE	DRAWING NO.	FIGURE
PWK	TRH	1" = 700'	–	1-2

Figure 3

Solid Waste Management Unit Sites

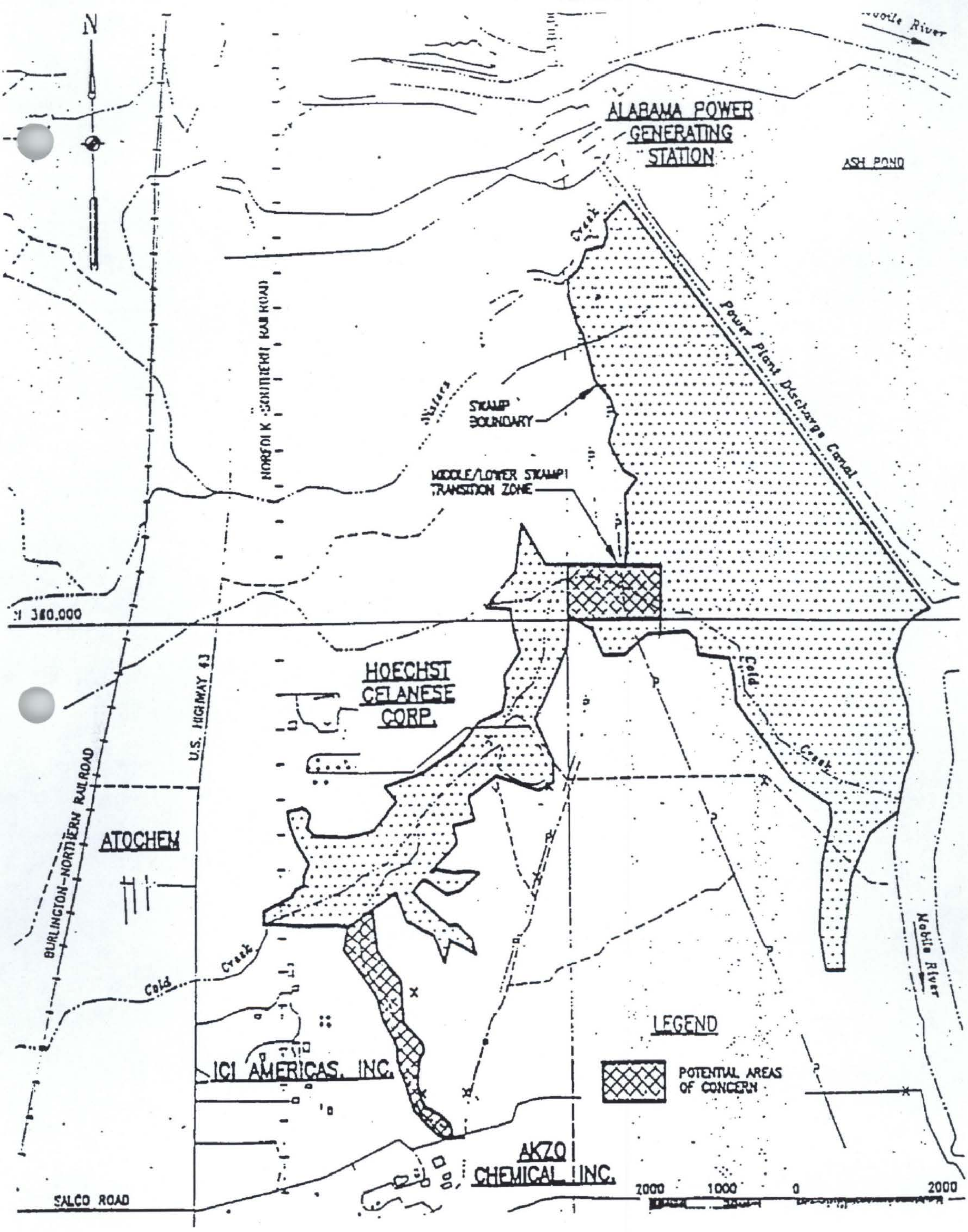


Figure 4

Selected Clean-Up Plan

REFERENCE 6

Region 4: Superfund

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You are here: EPA Home Region 4 Superfund NPL/Caliber Sites-Alabama Stauffer Chemical Co. (LeMoyne)

Stauffer Chemical Co. (LeMoyne Plant)

Site Summary Profile

EPA ID: ALD008161176
Location: Axis, Mobile County, AL
Lat/Long: 30.969430, -088.017500
Congressional District: 01
NPL Status: Proposed: 09/08/83; Final 09/21/84
Affected Media: Ground water, Sediment, Soil
Cleanup Status: Site cleanup activities are underway
Site Reuse/Redevelopment: Continued use - industrial
Site Manager: Michael Arnett (arnett.michael@epa.gov)

- Site Background
- Threats and Contaminants
- Site Cleanup Plan
- Cleanup Progress

- Enforcement Activities
- Community Involvement
- Future Work
- Additional Information

National Information

- CERCLIS Site Profile
- Additional Site Documents
- Site Location
- Site Contaminants of Concern
- Site Alias

Photos/Multimedia

Site Photo Goes Here
- Additional Site Photos
- Site Video

Additional Resources

- Site Cleanup Terms - can be found in EPA's glossary
- EPA Guides to Cleanup Technologies
- Superfund Community Involvement (PDF) (17 pp, 130K, About PDF)

Site Background

The Stauffer Chemical (LeMoyne Plant) Site is located in Mobile County in Axis, Alabama, approximately 25 miles north of the City of Mobile. The site is adjacent to the Stauffer Chemical (Cold Creek Plant) Superfund Site. The two Sites cover approximately 950 acres. The Cold Creek Plant encompasses about 220 acres and the LeMoyne Plant encompasses 730 acres.

The LeMoyne plant began operations in the 1950s manufacturing various hazardous chemicals and is currently owned by Akzo Nobel, Inc. The plant manufactures multi-product organic and inorganic chemicals including carbon disulfide, sulfuric acid, sulfur chlorides, monochloroacetic acid (MCA), sodium hydrosulfide and Crystex, a proprietary sulfur compound.

From 1965 to 1974, waste from the plant was placed in an unlined landfill located on the eastern side of the property. The waste included brine muds, plant refuse, used chemical samples, and absorption oil. The LeMoyne Landfill was closed in 1975 with an impermeable cap and liner.

From 1965 to 1979, a small portion of land on the western end of the LeMoyne site was leased by Stauffer to the Halby Chemical Company, which manufactured dye chemicals. A waste pond (the "Halby Pond") was located in the southwest portion of the former Halby area, adjacent to the Norfolk Southern Railroad. Waste products and effluents, including thiocyanates, were reportedly held in this pond and eventually discharged to the adjacent Cold Creek Swamp.

The surrounding area is primarily industrial with a few residential communities within a few miles of the site.

Top of page

Threats and Contaminants

Several ponds containing contaminated soils and/or sludges exist at the Stauffer sites. Ground water at the site is contaminated with carbon tetrachloride, carbon disulfide, thiocarbamates, and thiocyanate.

Top of page

Site Cleanup Plan

Due to the size and complexity of the site, EPA identified four operable units (OUs): OU-1 (ground water). OU-2 (various contamination sources found at the site); OU-3 (contamination found in the 650-acre Cold Creek Swamp adjacent to the plant); OU-4 (still being assessed and defined). OUs 1 and 3 are common operable units between the adjacent Stauffer Sites.

The Record of Decision (ROD) for OU-1 was issued in 1989. The cleanup approach included:

Modify existing ground water intercept and treatment system and install additional monitoring and extraction wells.

Continue extracting ground water from the surficial aquifer via existing and additional extraction wells.

Monitor ground water movement at the site to determine the adequacy of the cleanup activities.

Ground water monitoring at the sites for 30 years.

The ROD for OU-2 was issued in 1999. Major components of the cleanup approach included:

Construction of a soil flushing system in the former Halby area to accelerate the migration of contaminants from the subsurface soil into the ground water where contaminants will be remediated by the existing OU-1 treatment system.

Monitoring of subsurface soil for cyanide and thiocyanate in the former Halby area on an annual basis.

Institutional controls to restrict construction on the former Halby area until the subsurface soil performance standards are met and EPA determines that the site is available for unrestricted use.

The ROD for OU-3 was issued in 1993. Major components of the cleanup approach included:

Excavation of contaminated soil from the Transition Zone area of the Cold Creek Swamp.

Disposal of the soil in the Upper Arm Swamp Zone. Soil will be capped.

A ROD has not yet been developed for OU-4.

Top of page

Cleanup Progress

All components of the ground water extraction system for OU-1 are currently in place and operating.

The Remedial Design for OU-2 has been completed. The responsible parties stated to undertake the cleanup activities for OU-2, but the Chemtura Corporation (successor to Halby Chemical Company) is currently in bankruptcy. The U.S. Attorney, on behalf of EPA, is working with the Bankruptcy Court to resolve this issue.

In an effort to minimize wetland and woodland habitat loss and to reduce remedy costs, Akzo Nobel voluntarily submitted a request (with supporting documentation, including a 2008 Focused Feasibility Study) to EPA, proposing that the OU-3 remedy be updated to allow the use of AquaBlok®, an in-situ capping technology, which would physically isolate the contaminated sediments in the Upper Arm Swamp Zone. AquaBlok®, a product patented in 1996, was developed for the purpose of sealing off and isolating contaminated sediments in place without significant disturbance to existing deepwater or wetland habitats. At the time the OU-3 ROD was signed, AquaBlok® had not been developed; therefore, it was not available for consideration in 1993.

EPA evaluated Akzo Nobel's proposal and in August 2008 issued a Proposed Plan based on the results of this evaluation. EPA subsequently determined that the Superfund process could not move forward until EPA and the PRP negotiated an Administrative Settlement Agreement and Order on Consent (AOC) requiring Akzo Nobel to submit a new and expanded Focused Feasibility Study for EPA's consideration. The AOC was finalized on November 30, 2009. Akzo Nobel submitted the Focused Feasibility Study (FFS) in January 2010 and the FFS was finalized in July 2010. Based on the review of this FFS, EPA has issued a new Proposed Plan to amend the OU-3 1993 remedy.

The first Five-Year Review (FYR) for the ground water remedy (OU-1) was conducted in 1999, and confirmed that the remedy continues to be protective of human health and the environment. The second FYR, conducted in 2005, similarly found the remedy to be protective. Currently EPA is conducting the third FYR. The results of the review will be known later this year.

Share

Site cleanup activities are being led primarily by potentially responsible parties (PRPs) with oversight by EPA.

Top of page

About Region 4
Newsroom
Region 4 Superfund
Site Profiles
Site Cleanup
Site Assessment
Emergencies
Oil Spills
Community Involvement & Outreach
Enforcement
Superfund Records
Risk Assessment
Grants
Contracts

Enforcement Activities

In November 1984, EPA Region 4 sent a general notice letter to SCC notifying the company of potential liability for the contamination at the SCC Sites. In 1986, the PRPs entered into an Administrative Order on Consent with EPA to perform a Remedial Investigation/Feasibility Study (RI/FS).

Stauffer Chemical contracted to conduct the RI/FS under a consent agreement with the EPA. In 1990, a Consent Order was executed under which PRPs agreed to perform the remedial design/remedial action for OU-1.

EPA and the PRP negotiated an Administrative Settlement Agreement and Order on Consent (AOC) for OU-3. The AOC was finalized on November 30, 2009 and required Akzo Nobel to submit a new and expanded Focused Feasibility Study for EPA's consideration.

Top of page

Community Involvement

EPA has conducted a range of community involvement activities at the Stauffer sites to solicit community input and to ensure that the public remains informed about site activities throughout the site cleanup process. Outreach activities have included public notices, information meetings on cleanup progress and activities, public comment periods on changes to the cleanup plan, and a Community Relations Plan completed in 1985.

Most recently, EPA is conducting a 30-day public comment period, starting July 31, 2010 and ending August 30, 2010, to receive comments on a Proposed Plan to amend the OU-3 ROD.

Top of page

Future Work

The ground water extraction system for OU-1 will continue to operate.

An amended Record of Decision for OU-3 was finalized in 2010.

The next Five-Year Review was completed in 2010.

Top of page

Site Repository

For more information or to view any site related documents, please visit the site information repository at the following location. As new documents are generated, they will be placed in the information repository for public information.

Satsuma Public Library
5466 Old Highway 43
Satsuma, AL 36572

For documents not available on the website, please contact the Region 4 Freedom of Information Office.

Top of page

REFERENCE 7

Stauffer Chemical Co. (Cold Creek Plant)

Site Summary Profile

EPA ID: ALD095688875
Location: Bucks, Mobile County, AL
Lat/Long: 30.975000, -088.021380
Congressional District: 01
NPL Status: Proposed: 09/08/1983; Final: 09/21/1984
Affected Media: Ground water, Sediment, Soil
Cleanup Status: Construction Underway - physical cleanup activities at site have started
Site Reuse/Redevelopment: Continued use - industrial
Site Manager: Michael Arnett (arnett.michael@epa.gov)

Site Background
Threats and Contaminants
Site Cleanup Plan
Cleanup Progress

Enforcement Activities
Community Involvement
Future Work
Additional Documents

National Information

CERCLIS Site Profile
Additional Site Documents
Site Location
Site Contaminants of Concern
Site Aliases

Photos/Multimedia

Site Photo Goes Here.
- Additional Site Photos
- Site Video

Additional Resources

Site Cleanup Terms - can be found in EPA's glossary
EPA Guides to Cleanup Technologies
Superfund Community Involvement (PDF) (17 pp, 130K, About PDF)

Site Background

The Stauffer Chemical (Cold Creek Plant) Site is located in Mobile County near Bucks, Alabama, approximately 25 miles north of the City of Mobile. Adjacent to the site is the Stauffer Chemical (LeMoyne Plant) Superfund Site. The land surrounding both Superfund sites is predominantly industrial, involving chemical processing and electrical power generation.

The Cold Creek Plant began operations in 1966, manufacturing a variety of agricultural chemicals. Wastewaters from the Stauffer processes were held in clay-lined lagoons and discharged to the nearby 650-acre Cold Creek Swamp until approximately 1975. The plant is currently owned by Zeneca, Inc. and continues to operate.

Top of page

Threats and Contaminants

Manufacturing processes at both Superfund sites involved numerous contaminants including carbon disulfide, sulfuric acid, carbon tetrachloride, caustic/chlorine, Crystex (a sulfur compound), thiocarbamates and various metals including mercury.

Across both Sites, several ponds containing contaminated soils and/or sludges were identified. Thiocarbamates were detected in the ground water at the Cold Creek Site. Carbon tetrachloride, carbon disulfide and thiocarbamates were found in wells in nearby off-site property (Courtaulds property).

Assessments conducted during the late 1980s did not detect any contaminants in nearby drinking water wells. Therefore, it was concluded that no risk appeared to exist from exposure to contaminated ground water at the sites. However, humans could be exposed primarily to mercury contamination by consuming sediments and fish in Cold Creek Swamp.

Top of page

Site Cleanup Plan

The cleanup plan for the Stauffer Chemical (Cold Creek Plant) site covers three operable units (OUs): OU-1: (ground water contamination); OU-2 (various contamination sources found at the site); and OU-3 (surface water and sediment contamination found in the Cold Creek Swamp). OU-1 and OU-3 are common OUs at both Stauffer Chemical Company (SCC) Superfund Sites.

The Record of Decision (ROD) for OU-1 was issued in 1989. Major components of the cleanup approach included:

Continued use of existing ground water intercept and treatment system.

Installation of additional ground water extraction wells.

Modifications to ground water treatment system to be determined.

Monitoring of effluent, ground water concentrations and pumping rates.

In 1995, the potentially responsible party (PRP) completed the design for the modification of a ground water treatment system.

The Record of Decision for OU-2 was issued in 1995. Major components of the cleanup approach included:

No further action for the Cold Creek LeCreek Wastewater Treatment Pond.

Maintain the cap for the Cold Creek North Landfill and Cold Creek South Landfill, with continued ground water monitoring.

Bioremediation of contaminated soil, backfilling and capping of the Old Neutralization Pond.

In 1999, the cleanup approach for OU-2 was expanded, through an Explanation of Significant Differences, by adding excavation and off-site disposal for the more highly contaminated soils in the Old Neutralization Pond. The OU-3 ROD was issued on 1993. The ROD calls for, among other things, the excavation of contaminated soil from the Transition Zone area of the Cold Creek Swamp and disposal of the soil in the Upper Arm Swamp Zone. The Upper Arm would be capped.

In August 2008, EPA issued a Proposed Plan to amend the OU-3 ROD to replace the cleanup plan selected in the 1993 ROD. The amended ROD will now incorporate installation of an innovative on-site(in-situ) capping technology within the Upper Arm Swamp Zone and require an enhanced monitoring program for the Transition Zone. This new capping technology was developed in 1996 and therefore was not available for consideration in 1993.

Further, implementing the new capping technology will result in less wetland loss and wildlife habitat destruction, while providing a comparable level of protectiveness to that of the capping technology chosen in 1993. Implementing the new technology will also result in a significant cost savings. It is estimated that today it would cost $34,930,000 to implement the 1993 ROD. It is projected that the proposed amended ROD will cost $6,200,000 to implement.

Top of page

Clean-up Progress

All components of the ground water extraction system for OU-1 are currently in place operating.

The PRP developed the Remedial Design for OU-2 and is conducting the OU-2 Remedial Action.

In an effort to minimize wetland and woodland habitat loss and to reduce remedy costs, Akzo Nobel voluntarily submitted a request (with supporting documentation, including a 2008 Focused Feasibility Study) to EPA, proposing that the OU-3 remedy be updated to allow the use of AquaBlok®, an in-situ capping technology, which would physically isolate the contaminated sediments in the Upper Arm Swamp Zone. AquaBlok®, a product patented in 1996, was developed for the purpose of sealing off and isolating contaminated sediments in place without significant disturbance to existing deepwater or wetland habitats. At the time the OU-3 ROD was signed, AquaBlok® had not been developed; therefore, it was not available for consideration in 1993.

EPA evaluated Akzo Nobel's proposal and in August 2008 issued a Proposed Plan based on the results of this evaluation. EPA subsequently determined that the Superfund process could not move forward until EPA and the PRP negotiated an Administrative Settlement Agreement and Order on Consent (AOC) requiring Akzo Nobel to submit a new and expanded Focused Feasibility Study for EPA's consideration. The AOC was finalized on November 30, 2009. Akzo Nobel submitted the Focused Feasibility Study (FFS) in January 2010 and the FFS was finalized in July 2010. Based on the review of this FFS, EPA has issued a new Proposed Plan to amend the OU-3 1993 remedy.

The first Five-Year Review (FYR) for the ground water (OU-1) remedy review, conducted in 1999, confirmed that the remedy continues to be protective of human health and the environment. The second FYR, conducted in 2005, similarly found the remedy to be protective. Currently EPA is conducting the third FYR. The results of the review will be known later this year.

Site cleanup activities are being led primarily by PRPs with oversight by EPA.

Top of page

Enforcement Activities

In November 1984, EPA Region 4 sent a general notice letter to SCC notifying the company of potential liability for the contamination at the SCC Sites. In 1986, the PRPs entered into an Administrative Order on Consent with EPA to perform a Remedial Investigation/Feasibility Study (RI/FS).

SCC contracted to conduct the Remedial Investigation/Feasibility Study (RI/FS) under a consent agreement with the EPA. In 1990, a Consent Order was executed under which PRPs agreed to perform the remedial design/remedial action for OU-1.

EPA and the PRP negotiated an Administrative Settlement Agreement and Order on Consent (AOC) for OU-3. The AOC was finalized on November 30, 2009 and required Akzo Nobel to submit a new and expanded Focused Feasibility Study for EPA;'s consideration.

Top of page

Community Involvement

EPA has conducted a range of community involvement activities at the Stauffer Chemical (Cold Creek Plant) site to solicit community input and to ensure that the public remains informed about site activities throughout the site cleanup process. Outreach activities have included public notices and information meetings on cleanup progress and activities.

Most recently, EPA is conducting a 30-day public comment period, starting July 31, 2010 and ending August 30, 2010, to receive comments on a Proposed Plan to amend the OU-3 ROD.

Top of page

Future Work

The ground water extraction system for OU-1 is continuing to operate.

The final phase of the Remedial Action for OU-2 is planned to be completed by the end of 2012.

An amended Record of Decision for OU-3 was finalized in 2010.

The next Five-Year Review was completed in 2010.

Top of page

Site Repository

For more information or to view any site related documents, please visit the site information repository at the following location. As new documents are generated, they will be placed in the information repository for public information.

Satsuma Public Library
5466 Old Highway 43
Satsuma, AL 36572

For documents not available on the website, please contact the Region 4 Freedom of Information Office.

Top of page

REFERENCE 8

ADEM

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
POST OFFICE BOX 301463 36130-1463 ♦ 1400 COLISEUM BLVD. 36110-2059
MONTGOMERY, ALABAMA
WWW.ADEM.STATE.AL.US
(334) 271-7700

JAMES W. WARR
DIRECTOR

DON SIEGELMAN
GOVERNOR

Facsimiles: (334)

Administration:	271-7950
General Counsel:	394-4332
Air:	279-3044
Land:	279-3050
Water:	279-3051
Groundwater:	270-5631
Field Operations:	272-8131
Laboratory:	277-6718
Mining:	394-4326
Education/Outreach:	394-4383

June 11, 2001

MEMORANDUM

TO: Amy P. Zachry
Special Services Unit
Land Division

THROUGH: Robert W. Barr, Chief RWB 6/11/01
Environmental Compliance Section, HWB
Land Division

Clethes Stallworth, Chief for CS
Compliance & Enforcement Unit, HWB
Land Division

FROM: Nick Wolf NJW
Compliance & Enforcement Unit, HWB
Land Division

JUN 2001
RECEIVED
LAND DIVISION

RE: **Tencel Inc.**

The Compliance & Enforcement Unit has reviewed the information attached. It has been determined that the Tencel Plant in Mobile, AL is a separate operating unit and is required to have its own USEPA Identification Number. The Compliance and Enforcement Unit requests that a USEPA Identification Number be issued to Tencel, Inc.

Relationship between Tencel Inc. and Acordis Cellulosic Fibers Inc.

Acordis Cellulosic Fibers Inc. and Tencel Inc., both of which were originally owned and operated by Courtaulds Fibers Inc., an Alabama corporation and an indirect subsidiary of Courtaulds plc, are now separate corporate entities, the result of a series of purchases and sales that began with the acquisition of Courtaulds plc by Akzo Nobel N.V. of the Netherlands in 1998. The worldwide fiber businesses of Courtaulds plc and Akzo Nobel N.V. were then amalgamated into a self-contained commercial organization, Acordis. Courtaulds Fibers Inc. changed its name to Acordis Cellulosic Fibers Inc. (ACFI) on October 30, 1998, and remained an Alabama corporation. ACFI owned both the rayon and Tencel plants in Axis, Alabama at the time the VSI was conducted.

In 1999, CVC Capital Partners approached Acordis and Akzo Nobel N.V. to propose a venture capital buyout. This buyout became effective December 31, 1999. In the course of the buyout, the rayon assets of ACFI (the Alabama corporation) were sold to a newly-formed Delaware corporation, also named Acordis Cellulosic Fibers Inc. At the same time, the Tencel assets were sold to another newly-formed Delaware corporation, Tencel Inc. In the process, Acordis Cellulosic Fibers Inc. and Tencel Inc. became separate corporations. Both are wholly-owned subsidiaries of Acordis U.S. Holding, Inc., but have separate and independent managements reporting to different chief executives. Each corporation has its own Dun & Bradstreet Number.

The sites are physically separated by a railroad line (Norfolk Southern). Each site has its own 90-day hazardous waste accumulation area, makes its own arrangements for waste disposal, and prepares its own waste manifests.

All services provided to Tencel Inc. by Acordis Cellulosic Fibers Inc. are provided at arm's length, for compensation, subject to a formal Site Services Agreement.

REFERENCE 9

WSP

RECEIVED
MAY 23 2008
[illegible]

May 22, 2008

Mr. Antwan Parker
Alabama Department of Environmental Management
Land Division
1400 Coliseum Boulevard
Montgomery, AL 36110-2059

Re: Risk Management Plan
QLT of Alabama LLC in Axis, Alabama - VCP Site No. 461-9329

Dear Mr. Parker:

On behalf of QLT of Alabama, WSP Environment & Energy is submitting one copy of the referenced document. The enclosed report was developed for Voluntary Cleanup Site No. 461-9329 (former Acordis Cellulosic Fibers, Inc. facility in Axis, Alabama).

If you have any questions or require additional information, please do not hesitate to call.

Sincerely,

Richard E. Freudenberger

Richard E. Freudenberger
Vice President

REF:cbm:slp
K:\QLT of Alabama\Acordis_218287\09_RMP\6_Reporting\20080522 QLT AL RMP CL.doc

Enclosure

cc/encl.: Barry Gerstein, Quanta Holdings
Reynolds Renshaw, Renshaw Consulting Group, LLC
John Stewart, Acordis Cellulosic Fibers, Inc.
John Black, WSP Environment & Energy
Colleen Myers, WSP Environment & Energy
Pat Peterson, WSP Environment & Energy

WSP Group plc
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WSP Environment & Energy
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Fax: (412) 920-7455
www.wspenvironmental.com

WSP

RISK MANAGEMENT PLAN
FORMER ACORDIS CELLULOSIC FIBERS INC.
12740 U.S. HIGHWAY 43
AXIS, ALABAMA

PREPARED

FOR

QLT OF ALABAMA, LLC

BY

WSP ENVIRONMENT & ENERGY

MAY 22, 2008

WSP Environment & Energy
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Pittsburgh, PA 15220
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WSP Group plc
Offices worldwide

Contents

Contents
(continued)

List of Figures:

List of Tables:

Contents
(continued)

List of Appendices:

Certification

I certify that I am a qualified groundwater scientist who has received a baccalaureate and a postgraduate degree in geology and has sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses that enable me to make sound professional judgments regarding the application of geological principals or data. I certify that the information contained in or accompanying this Risk Management Plan, dated May 22, 2008, is true, accurate, and complete. As to those portions of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and all attachments were prepared at my direction in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted.

COLLEEN BONNER MYERS
LIC. 1107
ALABAMA LICENSED PROFESSIONAL GEOLOGIST

Colleen B. Myers
Professional Geologist: Colleen Myers (P.G. 1107)

5/22/08
Date

Acronym List

ADEM	Alabama Department of Environmental Management
ARBCA	Alabama Risk-Based Corrective Action
bgs	below ground surface
cm/sec	centimeters per second
COC	chemical of concern
CW	compliance well
DRO	diesel range organics
EDR	Environmental Data Resources
EPA	U.S. Environmental Protection Agency
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MSL	mean sea level
NFA	no further action
PCE	tetrachloroethene
POE	point of exposure
PRG	preliminary remediation goals
PSV	Preliminary Screening Values
RBTL	risk-based target level
RM-1	Risk Management 1
RM-2	Risk Management 2
RMP	Risk Management Plan
ROE	route of exposure
SCEM	Site Conceptual Exposure Model
SVOC	semi-volatile organic compound
TCE	trichloroethene
TPH	total petroleum hydrocarbons
UCL	upper confidence limit
µg/l	micrograms per liter
USGS	U.S. Geologic Survey
VCP	Voluntary Cleanup Plan
VOC	volatile organic compound
VPAR	Voluntary Property Assessment Report

1.0 Introduction

On behalf of QLT of Alabama, LLC, WSP Environment & Energy (formerly known as WSP Environmental Strategies) has prepared this Risk Management Plan (RMP) for the former Acordis Cellulosic Fibers Inc., facility (Property) located at 12740 U.S. Highway 43 in Axis, Alabama (Figure 1).

The purpose of this RMP is to present the rationale and approach for additional corrective actions, if required, at the Property. The goal of the actions described in this RMP is to achieve applicable site-specific risk-based target levels (RBTLs) at the Property as identified in the most recent Groundwater Monitoring Program, Quarterly Report #12 of 12, Third Quarter 2007, dated December 11, 2007 (WSP Environmental Strategies 2007). This RMP achieves that purpose by:

- describing ongoing interim corrective actions and monitoring activities
- defining the current Site Conceptual Exposure Model (SCEM)
- defining the cleanup objectives that are required to meet the applicable RBTLs
- identifying and recommending corrective action technologies that will most effectively achieve the corrective action objectives based on site conditions

This RMP was developed in accordance with the Alabama Department of Environmental Management's (ADEM) Admin. Code R. 335-6-10 (ADEM 2003a), 335-6-11 (ADEM 2003b), and 335-6-15 (ADEM 2003c), the Alabama Risk-Based Corrective Action (ARBCA) Guidance Manual (ADEM 2007), and the Alabama Environmental Investigation and Remediation Guidance (ADEM 2002).

2.0 Site Characterization

As part of the ARBCA evaluation, the available site data must be reviewed and data gaps identified. A comprehensive chronology of events related to reported releases, site characteristics, and remedial activity, has been developed to describe the soil and groundwater impacts at the Property.

2.1 Chronology of Events

Acordis retained WSP to design and oversee a comprehensive voluntary assessment of the entire Property. P.E. LaMoreaux & Associates, Inc., was retained to perform the Stage I field investigation activities (Stage I Assessment) in October, November, and December 2002, and subsequently the Stage II field investigation activities (Stage II Assessment), which were conducted in March and April 2003 (Environmental Strategies 2004a). The results of the comprehensive two-stage investigation were summarized in the Application and Voluntary Property Assessment Report (VPAR; Environmental Strategies 2004a) and a Voluntary Cleanup Plan (VCP), which were submitted to the ADEM on May 5, 2004 (Environmental Strategies 2004b).

During 2004, Environmental Strategies conducted additional delineation and confirmation sampling activities to evaluate the presence and extent of total petroleum hydrocarbons (TPH) in soil above applicable regulatory standards in five limited areas of the site: Fuel Oil Tanks Area, Above Ground Diesel Tanks Area, Hydraulic Press Area, the Hydraulic Rolls Area, and the Former Non-PCB Transformer Area.

Soil remediation work was performed in 2007 in accordance with the Total Petroleum Hydrocarbon Soil Excavation Work Plan, submitted on July 5, 2006. During excavation in the Above Ground Diesel Tanks area, three former underground storage tanks were encountered. Previously, the tanks had been closed in place by filling the tanks with sand. The tanks were cut open, the sand was removed, and the areas were properly backfilled. Post-excavation confirmation samples did not contain concentrations of TPH above the applicable cleanup standard (100 milligrams per kilogram [mg/kg]). The results of the remedial activities were provided to the ADEM in the Completion Report, Total Petroleum Hydrocarbon Soil

Excavation, dated January 21, 2008 (Environmental Strategies 2008). On February 29, 2008, the ADEM approved no further action (NFA) for these areas.

In accordance with the 2004 VCP (Environmental Strategies 2004b), remedial activities have been conducted in several other areas of the Property. Although the Stage II Assessment results revealed no evidence that the Former Non-Hazardous Waste Landfill has impacted soils or groundwater, the VPAR identified the Former Non-Hazardous Waste Landfill as an area requiring remedial activities, primarily for aesthetic purposes. Therefore, surface debris was voluntarily removed and the soil cover restored. The work was conducted in accordance with the Design Report, Sludge Lagoon Closure (Environmental Strategies 2005). No further investigation or remediation of this area is warranted.

With respect to the Sludge Lagoons, the Stage II Assessment revealed no evidence that the Sludge Lagoons were impacting soils or groundwater; however, permanent closure was one of several remedial actions identified for the site. The Sludge Lagoons are being closed as a best management practice to eliminate potential safety concerns. Closure will reduce the potential for human and ecological exposure to constituents and eliminate the need to remove accumulated storm water from the lagoons. The ongoing remedial activities being conducted in the Sludge Lagoon area are detailed in the Design Report, Sludge Lagoon Closure (Environmental Strategies 2005).

As described in the VPAR (Environmental Strategies 2004a), sulfates identified in many areas of the site are attributable to the use of sulfur compounds during historical production operations. In 2004 and 2006, WSP Environmental Strategies conducted additional soil sampling in the Sodium Sulfate Loading Area; the results indicated that site conditions that lead to the initial decision to remediate were no longer present. The results of the investigation of the Sodium Sulfate Loading Area were provided to the ADEM in correspondence dated September 28, 2006 (WSP Environmental Strategies 2006). On November 16, 2006, the ADEM issued an NFA for this area; however, the groundwater monitoring program was modified to include sulfide and sulfate analyses.

2.1.1 Groundwater Monitoring Program

The groundwater monitoring program, a component of the VCP (Environmental Strategies 2004b), was conducted in accordance with ADEM Administrative Code Rule 335-15 for participation in the Brownfield Redevelopment and Voluntary Cleanup Program

(ADEM 2003c). Sixteen groundwater monitoring wells (monitoring wells MW-10, MW-12, MW-14, MW-16, MW-17, MW-18, MW-21, MW-22, MW-24, MW-25, MW-26, MW-27, MW-29, MW-30, MW-31R, and MW-32) comprised the groundwater monitoring program, and were monitored for a 3-year period, which began with the fourth quarter 2004 sampling event (Environmental Strategies 2005a; Figure 2). The final sampling event was conducted in the third quarter of 2007 (WSP Environmental Strategies 2007). The groundwater monitoring program included collecting quarterly groundwater elevation data and groundwater samples from monitoring wells located in the following areas:

- Former Non-Hazardous Waste Landfill: monitoring wells MW-21 (upgradient) and MW-26 (downgradient)
- Sludge Lagoon area: monitoring wells MW-18 (upgradient) and MW-17 (downgradient)
- Rayon Plant and the Tencel Plant: monitoring wells MW-25 and MW-10 (upgradient of the Rayon Plant and downgradient of the Tencel Plant)
- sodium hydroxide and diesel tanks and former underground storage tanks: monitoring well MW-24
- northern property boundary: monitoring wells MW-29 and MW-30
- southern property boundary: monitoring wells MW-12, MW-14, MW-16, MW-22, MW-27, MW-31R, and MW-32; monitoring well MW-31R replaced monitoring well MW-31 in December 2005

The groundwater sampling results were compared to preliminary screening values (PSVs), as requested by ADEM (ADEM 2006a and 2006b). Quarterly groundwater monitoring reports were submitted to the ADEM subsequent to each sampling event.

2.2 Site Description and Land Use

The Acordis facility is located at 12740 U.S Highway 43 in Axis, Mobile County, Alabama, approximately 17 miles north of Mobile (Figure 1). Approximately 60 percent of the site is heavily wooded, 25 percent is vegetated with native grasses, and 10 percent is paved or otherwise improved with buildings or other structures. The facility is located at latitude 30° 57' 44" N and longitude 88° 00' 40" W. The plant occupies approximately 580 acres and is bordered by U.S. Highway 43 to the west, the Mobile River to the east, Akzo Nobel Functional Chemicals to the north, and E.I. DuPont De Nemours & Co. to the south. The plant was constructed in 1952 and underwent several expansions until ceasing operations in 2001. The plant produced rayon staple using the viscose process. In September 2003, the Property was transferred to its current owner, the Industrial Development Authority of Mobile County. The area surrounding the facility is predominately industrial, with a small number of rural residential communities within a few miles of the site.

2.3 Site Hydrology, Geology, and Hydrogeology

The topography of the Property is generally flat ranging from 30 to 40 feet above mean sea level (MSL), except where creeks have altered the terrain. The highest topographical elevations at the site are associated with man-made structures (Environmental Strategies 2004a).

2.3.1 Site Hydrology

The Property is located within both the Alluvial-Deltaic Plain and the Coastal Lowland Districts of the East Gulf Coastal Physiographic Province. The Alluvial Deltaic District consists of alluvial and terrace deposits and the Coastal Lowlands District areas are characterized by flat to gently undulating, locally swampy plains underlain by terrigenous deposits of the Holocene and late Pleistocene ages.

The Acordis facility is located on a terrace of Quaternary alluvium that extends directly east to the Mobile River. As is characteristic of fluvial deposits, the terraces and floodplain sediments consist of sand and clay seams and clay beds in lateral and vertical sequence. Drainage from the site is generally east and northeast toward an unnamed branch of Cold Creek, a tributary of the Mobile River. Although the topography is generally flat, wetlands, manmade relief, and a maximum relief of 20 to 25 feet occurs where creeks have altered the terrain. The operational portions of the facility are located within 2,000 feet of the 100-year flood plain for the Mobile River (Environmental Strategies 2004a).

Water bodies in the immediate vicinity of the facility include the Mobile River (located directly adjacent to the facility to the east), Cold Creek (located approximately one mile to the north), and a canal operated by Mobile Water Service System (located approximately 1.5 miles to the west).

All storm water runoff at the Property is managed by a runoff collection system; however, the particular management and discharge method for the runoff depends upon the area of the facility over which the precipitation falls. Storm water runoff from the primary manufacturing process areas of the former Rayon Plant drains to underground storm sewers and is discharged through a diffuser at the primary plant outfall into the Mobile River. Storm water runoff from other areas of the Property is directed to various surface discharge outfalls around the plant site. Storm water that falls along the outer perimeter of the Current Non-Hazardous Waste Landfill is managed in the Storm water Retention Pond prior to final discharge (Environmental Strategies 2004a).

2.2.2 Site Geology and Hydrogeology

The unsaturated zone in the vicinity of the Property extends to a depth of approximately 50 feet below ground surface (bgs; -10 feet MSL). The near-surface strata are a sequence of essentially flat-lying terraces composed of poorly consolidated to unconsolidated sands, gravel, and silty sandy clay. The uppermost 10 to 15 feet of the unsaturated zone is composed of relatively impermeable orange to white silty clay to clayey silt. Permeability testing of the surficial clay performed during a previous investigation indicated permeabilities ranging from 1.6×10^{-7} centimeters per second (cm/sec) to 4.6×10^{-6} cm/sec (Environmental Strategies 2004a).

The major aquifer of Mobile County is comprised of two formations, which are hydraulically connected. The Citronelle formation is the uppermost of two formations that unconformably overlies Miocene sediments. The second aquifer consists of Quaternary alluvium deposits located within the Mobile River Valley. This aquifer, often referred to as the Alluvial Aquifer, is the primary aquifer at the site.

Beneath the unsaturated surficial clay lies the surficial aquifer, approximately 60 to 80 feet of sand with clay streaks and/or clay lenses. Correlation of minor clay lenses was not possible between soil borings. The lower 40 feet of the aquifer consists of sand and gravel deposits that are highly permeable. Groundwater elevations in shallow and deep nested wells on the Property (DuPont wells MOB-83/84 and MOB-85/86) are the same in each well pair, indicating that there are no significant vertical gradients and that the surficial aquifer is a single, continuous aquifer. The sediments that comprise the surficial aquifer are Pleistocene or Holocene age and were deposited during the transgressive-regressive cycles of the Gulf of Mexico, with influence by the migrating course of the Mobile River (Environmental Strategies 2004a).

A bluish clay at a depth of approximately 120 feet (elevation averaging –80 feet MSL) is believed to be Miocene in age and is the first significant confining unit encountered beneath the surficial aquifer. The clay is persistent across the Property. The boring for process well PW-15 was drilled to a total depth of 410 feet and encountered 38 feet of the clay. The boring for process well PW-7 was drilled to 402 feet bgs and encountered 28 feet of the clay. Data obtained during the installation of monitoring wells and the Stage I Assessment activities confirm the extent of the Miocene clay layer (Environmental Strategies 2004a).

2.4 Water Use

As part of the VPAR (Environmental Strategies 2004a), a database search of potable water wells located near the Acordis facility was obtained from Environmental Data Resources (EDR). Results of the search indicate that three wells are located within a 1-mile radius. One well, located on the northeastern portion of the site, is listed on the Federal FRDS Public Water Supply System database (PWS Id # AL0001027) as an active well. Use of this well was terminated by Acordis in the mid 1990s.

A second well, located 0.50-mile east-northeast of the site is listed on the Federal U.S. Geological Survey (USGS) database (Id # 305743088010301) as being constructed in 1951 and completed at a depth of 123 feet bgs. The well was measured in 1951 and is estimated to be at an altitude of 43.10 feet MSL and depth to water was approximately 22.10 feet bgs.

The third well identified in the EDR report is located within 1.0 mile north of the site and is listed on the State of Alabama database (Id # AL00001036; well Id: 1028). The system name is listed as Zeneca Inc. and the source is CC-13. No other information was available for this well.

The ADEM, Groundwater Branch of the Water Division provided additional information on wells in the area of the site. The ADEM (www.adem.state.al.us) provided a compact disc containing the file: Geological Survey of Alabama, Hydrogeology and Vulnerability to Contamination of Major Aquifers in Alabama: Area 13. According to the information provided by the ADEM, four public water supply wells are located within a 1-mile radius of the facility. One well, located approximately 0.5 mile north of the site is listed as the MCB Water & Fire Protection system. Reportedly, the well was installed in 1996. Three wells, located south of the site, are identified on the LeMoyne Water System, Inc., system and were installed in 1973, 1982, and 1992. No other information was available for these wells.

All of the water wells identified above are upgradient of any former operations conducted at the Property and, thus, could not have been impacted by such operations.

The area is serviced by the local public water authority. Several water supply wells exist on the property that would allow ingestion of groundwater; however, the power supply to these wells has been removed and they have not been used since 2002. Therefore, no exposure to groundwater by onsite personnel is anticipated, and no changes are expected for onsite groundwater withdrawal. As part of the recommended actions presented in Section 7.0, the supply well exposure pathway will be eliminated.

2.5 Release Scenario and Source Characterization

The Stage I and Stage II Assessments and additional subsurface investigations, indicate that soil and groundwater impacts at the Property are limited, and the vast majority of the areas investigated do not contain constituents formerly used in the Acordis manufacturing process at levels above appropriate regulatory standards.

2.5.1 Chemicals of Concern

The groundwater samples collected as part of the groundwater monitoring program are analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), dissolved metals, mercury (dissolved), sulfate, and pH by U.S. Environmental Protection Agency (EPA) Methods 8260B, 8270C, 6010B, 7470A, and Standard Method 150.1 and 375.4, respectively. In addition, select groundwater samples collected as part of the groundwater monitoring program are also analyzed for N-methylmorpholine oxide (EPA Method 8321A) and diesel range organics (DRO) and higher carbon chains (EPA method 8015/3630 using a silica gel cleanup method).

2.5.2 Distribution of Chemicals of Concern

2.5.2.1 Soil

Soil sampling results from the Stage I and Stage II assessments did not indicate that soils with concentrations above EPA Region 9 Preliminary Remediation Goals (PRGs) were present onsite; however, TPH-impacted soils were identified. The TPH-impacted soils were further characterized and removal activities were conducted. TPH-containing soils were excavated, and

NFAs were approved by the ADEM for these areas. The Sulfate Loading Area was investigated for sulfate in soil and an NFA for this area was approved by the ADEM. Therefore, potential onsite soil source areas have been fully characterized and no impacts to soil are present onsite.

2.5.2.2 Groundwater

Groundwater at the site has been monitored as part of the established groundwater monitoring program.

2.5.2.2.1 VOCs

The VOCs detected at concentrations above PSVs in groundwater samples collected from Property monitoring wells during the last 4 sampling events are carbon tetrachloride, tetrachloroethene (PCE), and trichloroethene (TCE; Table 1). VOCs have been detected in groundwater samples collected from several monitoring wells along the southern property boundary (monitoring wells MW-12, MW-18, MW-22, MW-24, MW-25, MW-27, MW-31/MW-31R, and MW-32). The presence of VOCs in groundwater is limited to the area along and downgradient of the southern property boundary.

The DuPont Manufacturing Center is located adjacent to the property along the southern property boundary. Historically, DuPont has manufactured herbicides and insecticides for agricultural uses as well as a few specialty chemicals. A groundwater contaminant plume of carbon tetrachloride, chloroform, PCE, TCE, methylene chloride, and atrazene was discovered in 1982 (ADEM 2001). To address VOCs in groundwater, DuPont installed and has operated three groundwater extraction wells (E-1, E-3, and E-4) near the Acordis/DuPont property boundary. In July 2003, DuPont submitted a Corrective Measures Study to ADEM to address the residual groundwater contamination on the DuPont property.

There is no evidence to suggest that carbon tetrachloride, PCE, and TCE were used during production operations at Acordis. Because monitoring data from DuPont's wells indicates VOC-impacted groundwater is present on DuPont's property, the likely source of VOCs in groundwater is from offsite.

2.5.2.2.2 SVOCs

Groundwater samples collected from monitoring wells MW-14 (bis(2-ethylhexyl)phthalate) and MW-25 (4-methyl morpholine n-oxide) during September 2003 contained concentrations of SVOCs above the PSVs (Table 1). Well MW-14 was installed to monitor groundwater along the southern property boundary; MW-25 was installed downgradient of the Tencel Plant and the southern property boundary. Subsequent groundwater samples from these monitoring wells did not contain concentrations of these SVOCs above PSVs (Table 1); therefore, SVOCs are not chemicals of concern (COCs) and were not considered further in this evaluation.

2.5.2.2.3 TPH

A concentration of 0.313 microgram per liter (µg/l) of TPH (DRO and higher carbon chains) was detected in the groundwater sample collected from MW-22 in July 2006; there is not a PSV for TPH. TPH has not been detected in groundwater samples collected from this monitoring well during the five subsequent sampling events; therefore, the presence of TPH in groundwater was limited in extent to the area near MW-22 and is not considered a COC. No further evaluation of TPH was conducted.

2.5.2.2.4 Metals

Historically, groundwater samples collected from Property monitoring wells contain concentrations of several metals above PSVs (arsenic, aluminum, antimony, calcium, copper, iron, magnesium, manganese, potassium, sodium and thallium; Table 1). At the request of ADEM, the method detection limit was used as a PSV for several of the metals (WSP Environmental Strategies 2007). Of the metals historically detected above PSVs, arsenic, calcium, iron, manganese, magnesium, potassium, sodium, and thallium have been detected above PSVs during the last four groundwater sampling events and are considered COCs.

Analytical results for these metals detected in groundwater samples collected from regional Alabama groundwater wells were retrieved from the USGS National Water Quality Assessment Data Warehouse (USGS 2008). Table 2 summarizes the maximum concentration detected in groundwater samples from Property monitoring wells and the USGS data. With the exception of calcium, magnesium, potassium, and sodium, none of the concentrations detected in groundwater samples collected from monitoring wells on the Property are above the USGS maximum concentration or geometric mean (Table 2).

Calcium, magnesium, potassium, and sodium are common, naturally occurring elements that are present in soils, sediments, and rocks (aquifer matrix). As water flows through these media, metals are dissolved from the matrix, and ultimately accumulate in groundwater. There are no Alabama, federal health based, or cosmetic/aesthetic drinking water standards for these constituents. The concentrations of these metals detected in groundwater samples collected from

Property monitoring wells are less than the maximum USGS values. Therefore, metals are not considered COCs and were not evaluated further.

2.5.2.2.5 Sulfates

The groundwater samples collected from monitoring wells MW-22 (1,200 milligrams per liter [mg/l]) and MW-26 (380 mg/l) in December 2002 contained concentrations of sulfates above the PSV of 250 mg/l. No sulfates have been detected at concentrations above the PSV in subsequent groundwater samples from these monitoring wells (Table 1); therefore, sulfates are not a COC and were not considered further in this evaluation.

2.5.2.3 Surface Water

No waters of the state have been identified on the Property; however, the Mobile River is located adjacent to the Property to the east. Monitoring well MW-26 is located downgradient of VOC-impacted groundwater and upgradient of the Mobile River. Based on its location, MW-26 acts as a sentinel well for the Mobile River. Groundwater samples were collected from MW-26 as part of the groundwater monitoring program. Concentrations of VOCs have not been detected above PSVs in groundwater samples collected from this monitoring well; therefore, the Property has not impacted the Mobile River.

2.5.2.4 Soil Vapors

Soil sampling results from the Stage I and Stage II assessments did not indicate that soils with concentrations above EPA Region 9 PRGs were present onsite; however, TPH-impacted soils were identified. During the TPH-impacted soil removal activities, soils with TPH concentrations above 100 mg/kg were removed, and the results of the activities were reported to the ADEM in the Completion Report, Total Petroleum Hydrocarbon Soil Excavation, dated January 21, 2008 (Environmental Strategies 2008). On February 29, 2008, the ADEM issued an NFA for these areas. Therefore, the soil containing TPH concentrations above 100 mg/kg were removed and there are no data indicating that the presence of COCs in soil vapor poses a concern at the site.

3.0 Preliminary Screening Level Evaluation

The objective of the preliminary screening level evaluation is to perform a preliminary risk evaluation to identify maximum site COC concentrations, source areas, and areas of interest within the Property that may need further evaluation. The screening level evaluation entails comparing *maximum* COC concentrations detected at the Property to conservative PSVs (ADEM 2007).

3.1 Comparison with Preliminary Screening Values

The following sections provide comparisons to PSVs for soil, groundwater, surface water, and soil vapor.

3.1.1 Soil

Potential onsite soil source areas have been fully characterized, remediated, and NFAs have been approved by ADEM for onsite soils. Therefore, no complete exposure pathways are associated with soils.

3.1.2 Groundwater

In accordance with Table 2-2 of the ARBCA Guidance Manual (ADEM 2007), PSVs for constituents in groundwater are equal to maximum contaminant levels (MCLs) listed in the ADEM Administrative Code Rule 335-7-2 (Primary Drinking Water Standards) and the U.S. EPA 2004 Edition of the Drinking Water Standards and Health Advisories (ADEM 2007). For constituents without established MCLs, PSVs are equal to the PRGs for tap water. In addition, ADEM requested that for several VOCs (2-hexanone), SVOCs (4-bromophyenyl phenyl ether, 4-chlorophyenyl phenyl ether, N-methylmorpholine oxide, bis(2-chloroethoxy)methane, o-nitrophenol, and phenacetin), and dissolved metals (calcium, magnesium, potassium, and sodium), that do not have ADEM PSVs, the PSVs be equal to the method detection limit (ADEM 200b). As recommended by the ADEM, a hazard quotient of 0.1 was applied to PRGs that were calculated based on their non-carcinogenic effects (ADEM 2007). A comparison of maximum historical groundwater sampling results to the PSVs is presented in Table 2.

The COCs detected at concentrations above PSVs in groundwater samples collected from Property monitoring wells are carbon tetrachloride, PCE, and TCE (Table 1). VOCs have been detected in groundwater samples collected from several monitoring wells along the southern property boundary (monitoring wells MW-12, MW-18, MW-22, MW-24, MW-25, MW-27, MW-31/MW-31R, and MW-32). The presence of VOCs in groundwater is limited to the area along and downgradient of the southern property boundary.

3.1.3 Surface Water

No waters of the state have been identified on the Property; however, the Mobile River is located adjacent to the Property to the east. Monitoring well MW-26 is located downgradient of VOC-impacted groundwater and upgradient of the Mobile River. Based on its location, MW-26 acts as a sentinel well for the Mobile River. Groundwater samples were collected from MW-26 as part of the groundwater monitoring program. Concentrations of VOCs have not been detected above PSVs in groundwater samples collected from this monitoring well; therefore, the Property has not impacted the Mobile River. Accordingly, surface water was not evaluated as part of the Risk Management 1 (RM-1) evaluation. However, surface water criteria are provided for the groundwater COCs in Appendix A, and the surface water protection exposure pathway for groundwater was evaluated (Section 5.0).

3.1.4 Soil Vapor

No soil vapor analytical data is available for comparison to PSVs. However, impacted soils have been removed and there are no data indicating that the presence of COCs in soil vapor poses a concern at the site.

4.0 Exposure Assessment

4.1 Introduction

4.1.1 Sources

Historically, several areas of the site were identified as areas of concern and were remediated (Section 2.1). With the exception of several areas impacted by TPH, no impacts to soils were identified. Groundwater impacts are primarily limited to groundwater near and downgradient of the southern property boundary. The COCs in this area are limited to chlorinated VOCs; the COCs have been detected in one or more groundwater samples at concentrations greater than PSVs.

4.1.2 Release Mechanisms and Transport Media

COCs migrated in groundwater from the upgradient property to onsite groundwater. No other potentially impacted media are present on the Property.

4.1.3 Receptors

In September 2003, the Property was transferred to its current owner, the Industrial Development Authority of Mobile County. As part of the lease agreement, the Property is restricted to commercial or industrial use for a period of 99 years after closing, or until 2102. However, in accordance with the ARBCA guidance, the residential scenario was evaluated; human receptors include persons who live or work within at least a 500-foot radius of the Property boundary. The most likely exposed human receptors are listed below (ADEM 2007):

- Residential – Child
- Residential – Adult
- Trespasser – Adolescent
- Commercial Worker – Adult
- Construction Worker – Adult

The eastern portion of the Property is adjacent to the Mobile River. Wetlands have been identified on historical design drawings north of the proposed borrow area and east of the Former Non-Hazardous Waste Landfill. Several bird and fish species are listed on Mobile County's threatened and endangered species list; however, no established or proposed critical habitat are identified in the County. In addition, none of these species have been identified onsite. No other non-human receptors have been identified (i.e., utilities, conservation areas, sensitive resource areas, agricultural areas, livestock, etc.) onsite.

4.1.4 Routes of Exposure

A receptor comes in contact with COCs through a complete exposure pathway. For a route of exposure (ROE) to be complete, there must be (i) a source of chemical, (ii) a mechanism by which the chemical is released, (iii) a medium through which a chemical travels from the point of release to the receptor location, and (iv) a route of exposure by which the chemical enters the receptors body and causes potential adverse health effects (ADEM 2007). ROEs include ingestion of groundwater and soil particulates, indoor and outdoor inhalation of vapors in the air, indoor and outdoor inhalation of vapors from soil and groundwater, dermal contact with soil, and, leaching to groundwater from surficial and subsurface soils. In accordance with the ARBCA guidance (May 2006), the potential exposure pathways that exist at the Property that were evaluated are discussed in Section 5.0.

4.2 Site Discretization into Exposure Units

The southern property boundary is the only exposure unit identified on the property. The exposure unit encompasses the area along the southern property boundary and downgradient onto the Property.

4.3 Site Conceptual Exposure Models for Exposure Units

The SCEM is a site-specific qualitative and quantitative description, or working hypothesis, of the migration and fate of COCs with respect to possible receptors and the geologic, hydrologic, biologic, geochemical, and anthropogenic factors that control chemical distribution (EPA 2004). Essentially, the SCEM expresses an understanding of the site structure, processes, and factors that affect COC fate, transport, and exposure.

The southern property boundary exposure unit includes the area along and downgradient of the southern property boundary. As described in Section 2.5, the release mechanism was migration of impacted groundwater from the upgradient property. Based on historical investigation data, there are no significant spatial heterogeneities in the subsurface characteristics. Therefore, the exposure unit is characterized by sand with clay streaks and/or clay lenses. The groundwater elevations indicate that the average depth to groundwater is approximately 28 feet bgs (Table 3). Impacted soils and soil vapor are not present in this area. Groundwater quality in this exposure unit is monitored by groundwater samples collected from monitoring wells monitoring wells MW-12, MW-18, MW-22, MW-24, MW-25, MW-27, MW-31/MW-31R, and MW-32. During the last 4 groundwater sampling events, the COCs detected at concentrations above PSVs were carbon tetrachloride, PCE, and TCE (Table 1). No affected utilities, sensitive ecological receptors, or surface water bodies have been identified in this exposure unit; however, supply wells are present in this area. The supply wells are not active at this time. The potential complete exposure pathways for this exposure unit include direct ingestion of groundwater, inhalation to indoor and outdoor air from groundwater, and groundwater and surface water resource protection.

4.4 Fate and Transport of COCs

The relative importance of the transport pathways listed above, and the extent of actual migration of COCs through them, depends primarily on the physical and chemical properties of the compounds and the physical characteristics of the Property. The fate and transport of COCs are evaluated by considering the physical and chemical interactions of the chemicals within the environment at the Property.

Advection is the process by which solutes are transported by the bulk motion of groundwater as driven by the hydraulic gradient. Dissolved COCs are also expected to disperse as they migrate with groundwater. Hydrodynamic dispersion of solutes may occur as a result of mechanical mixing or molecular diffusion. Chemical and biological degradation, together with adsorption, are the primary processes that can affect the mobility and persistence of organic COCs in soil and groundwater. Biologically mediated dehalogenation reactions tend to occur under low oxygen (anaerobic) conditions, while the breakdown of less halogenated compounds tends to be more prevalent in more oxygenated (aerobic) conditions. The absence of reduction in COC concentrations and chlorinated VOC daughter products in groundwater samples indicate that natural attenuation is not rapidly occurring at the Property (Table 1 and Appendix B).

5.0 RM-1 Evaluation

RM-1 RBTLs are generic media, receptor and pathway-specific concentrations that are developed for each COC, complete pathway, and receptor as identified in the SCEM. According to the ARBCA guidance, RM-1 levels are generic standards that are applied at sites where the source area(s) has been characterized, and the limited site data indicate the site is appropriate for application of the default values used to develop the RM-1 levels. The RM-1 levels are then compared with representative site concentrations. Based on this comparison, one of the following three decisions are possible:

- if an acceptable level of site investigation has been performed as determined by the ADEM, and the representative site concentrations at a site do not exceed the RM-1 levels, then the ADEM may grant the site NFA status
- adoption of RM-1 levels as the cleanup levels, and the development and implementation of a Corrective Action Work Plan
- evaluation of the site under Risk Management 2 (RM-2) option

5.1 Site Representative Concentrations

Initially, the RM-1 evaluation involves comparing the historical maximum media-specific concentrations relevant for each pathway with the PSVs (Section 3.1; ADEM 2007). If COCs are present at concentrations above the PSVs, site representative concentrations are then developed for comparison to the soil and groundwater RBTLs. According to the ARBCA guidance (ADEM 2007), depending on site conditions, multiple representative concentrations may need to be developed for a site (i.e., onsite vs. offsite receptors, exposure units, data availability, etc.). The calculation of representative concentrations is complicated by several factors, including: (i) spatial variability in the concentrations, (ii) temporal variability in the concentrations, and, (iii) lack of sufficient site-specific concentration data (ADEM 2007). To account for these factors, several methodologies may be used to estimate the representative concentrations. However, the ARBCA guidance suggests that representative concentrations for the RM-1 evaluation for groundwater be derived from either a maximum concentration or the 95th percentile upper confidence limit (UCL) of the ten most recent sampling events (ADEM 2007).

5.1.1 Soils

Potential onsite soil source areas have been fully characterized, remediated, and NFAs have been approved by ADEM for onsite soils. No complete exposure pathways are associated with soils; therefore, representative soil concentrations were not calculated.

5.1.2 Groundwater

The maximum concentrations, as determined from the ten most recent sampling events, of carbon tetrachloride, PCE, and TCE detected in groundwater samples collected from the monitoring wells located in southern property boundary area are above the PSVs (Table 2). Therefore, Mann-Kendall trend analyses were conducted to determine the statistical trend for COCs with concentrations above PSVs for two or more sampling events (monitoring wells MW-12, MW-22, MW-24, MW-25, MW-27, MW-31/MW-31R, and MW-32); the analytical data are summarized in Table 1, the trend analyses are summarized in Table 4, time-series plots are provided in Appendix B, and the calculations are provided in Appendix C.

In general, a review of the past several years of historical sampling results indicates that the concentrations of COCs in groundwater samples have shown no trends (Table 4). Although, statistically the concentration of carbon tetrachloride in groundwater samples collected from wells MW-12 and MW-24 have increased, the concentrations have fluctuated over time (Table 1 and Table 4).

In accordance with the ARBCA guidance, because an adequate amount of equally spaced data was available and no consistent statistical trends were observed, site representative concentrations were generated using the 95th percentile UCL. Non-detect values were represented by the detection limit, as required by the ARBCA guidance (ADEM 2007). The resultant representative concentrations for groundwater are provided in Table 5.

5.2 Selection and Development of RM-1 Levels

RM-1 RBTLs are developed to estimate the risk (individual excess lifetime cancer risk for carcinogenic effects or the hazard index for non-carcinogenic adverse health effects) for each complete ROE identified in the SCEM and each COC detected. The calculations utilize quantitative values of fate and transport parameters, physical and chemical properties of the COCs, and mathematical models. RM-1 target levels were developed using conservative default values located in Tables 3-1 through 3-4 of the ARBCA guidance and the models located in

Appendix B of the ARBCA guidance (ADEM 2007). The input parameters are presented in Table 6 through Table 8. After the RBTLs were developed, they were compared with the representative site concentrations (Table 9 and Table 10).

The point of exposure (POE) location is used to estimate the target soil and groundwater source concentrations and target compliance well (CW) concentrations protective of the POE. The POE for the groundwater resource protection evaluation is defined as the closest downgradient residential property boundary where a well is located. As no downgradient wells are present offsite, but a surface water body is present, the distance from monitoring well MW-27 to the Mobile River (10,510 feet) was defined as the POE (Table 7).

In the ARBCA evaluation, a CW is defined as a monitoring well located between the COC source area and the POE. The CW serves as a sentry or guard well(s) for the protection of the POE. The groundwater CW for the Site was defined as monitoring well MW-26, which is located approximately 8,455 feet from the downgradient edge of VOC-impacted groundwater (Table 7). The Mobile River, the POE, is approximately 9,083 feet from the downgradient edge of VOC-impacted groundwater. In addition, the ARBCA guidance requires CWs for the surface water resource protection pathway. The groundwater CW was also defined as the surface water CW (MW-26). The distance from the CW to the Mobile River was used as an input in the RM-1 evaluation; the Mobile River is approximately 2,009 feet from monitoring well MW-26 (Table 7).

The dimensions of the groundwater source at the southern property boundary were assumed to be 2,270 feet wide and 700 feet long; these dimensions were chosen based on the area of impacted groundwater in this area (Table 7). For the RM-1 evaluation, all other parameters were defined as the conservative ARBCA RM-1 defaults (Table 6 through Table 8; ADEM 2007).

5.3 Comparison with RM-1 Levels

A summary of the proposed RM-1 RBTLs is presented in Table 9; Appendix D contains the receptor-specific RM-1 RBTLs.

5.3.1 Soils

Although impacted soils at the Property have been removed and do not represent a complete exposure pathway, in accordance with Appendix B of the ARBCA guidance

(ADEM 2007), soil RM-1 RBTLs for all COCs detected in groundwater were calculated (Table 9). The exposure pathways evaluated for surficial soils include the inhalation of particulates, dermal contact, and direct ingestion pathways, protection of indoor and outdoor inhalation, leaching to groundwater, and groundwater resource protection (Appendix D). The exposure pathways evaluated for subsurface soils include the protection of indoor and outdoor inhalation, leaching to groundwater, and groundwater resource protection (Appendix D).

5.3.2 Groundwater

Several water supply wells exist on the property that would allow ingestion of groundwater; however, the power supply to these wells has been removed and the wells have not been used since 2002. Therefore, no exposure to groundwater by onsite personnel is anticipated, and no changes are expected for onsite groundwater withdrawal. WSP recommends that the supply well exposure pathway be eliminated.

The remaining potential complete exposure pathways evaluated for groundwater include inhalation to indoor and outdoor air from groundwater, soil to groundwater leaching, and groundwater and surface water resource protection. The RM-1 RBTLs were compared with the site representative concentrations for groundwater (Tables 10 and 11). The RM-1 RBTLs for the indoor inhalation from groundwater exposure pathway were calculated, and compared to site representative concentrations. The site representative COC groundwater concentrations for the source area are less than their respective RM-1 RBTLs for all exposure pathways (Tables 10 and 11), except the indoor air pathway for carbon tetrachloride. The site representative groundwater concentration for carbon tetrachloride (27.8 µg/l) is slightly above the indoor air inhalation RBTL (24.9 µg/l; Table 9). The COCs detected in groundwater samples collected from the CW are less that the RBTLs (Table 11).

Based on the calculated RM-1 RBTLs, the indoor air inhalation from groundwater for carbon tetrachloride is the only complete exposure pathway where COCs are present at concentrations above RBTLs (Tables 10 and 11).

6.0 RM-2 Evaluation

As the site representative groundwater concentrations do not meet RM-1 RBTLs for all potential exposure pathways, a RM-2 evaluation is recommended. RM-2 RBTLs are site-specific levels based on default and site-specific data, and are calculated using the models located in Appendix B of the ADEM's ARBCA guidance (ADEM 2007). The RM-2 evaluation allows site-specific decision-making for the selection of alternative fate and transport models, and input parameters that will result in a cumulative target cancer risk of 1×10^{-5} and/or hazard index of 1.0.

In accordance with the guidance (ADEM 2007), a RM-2 work plan should be developed and approved before a RM-2 evaluation is conducted. However, as part of this RM-1 effort, WSP evaluated the applicability of the default RM-1 parameters to the Property. After review of the default RM-1 input parameters, it is evident that site conditions vary from these defaults. In particular, the SCEM for the Property indicates that the recent site-specific average depth to groundwater (28.8 feet bgs; Table 3) varies significantly from the default RM-1 value (10 feet bgs).

The site-specific depth to water (28.8 feet bgs) was substituted into the RM-1 RBTL calculations; the resultant RM-2 RBTLs are summarized in Table 12 and provided in Appendix E. Although, additional alternate site-specific parameters could be used for a RM-2 evaluation, at this time, no other changes were made to the RM-1 evaluation inputs. The RM-2 RBTLs were compared with the site representative concentrations for groundwater. The site representative COC groundwater concentrations for the source area and CW are less than their respective RM-2 RBTLs for all exposure pathways (Tables 13 and 14). Therefore, as the site representative groundwater concentrations are less than RM-2 RBTLs, an NFA is requested.

7.0 Recommendations

The Property is in compliance with proposed RM-2 RBTLs; therefore, no corrective actions are recommended. After the ADEM has approved the RMP and the request for an NFA, the existing monitoring wells will be abandoned in accordance with ADEM requirements.

As discussed with the ADEM during a teleconference on April 25, 2008, the supply well exposure pathway will be eliminated. The supply wells may be abandoned according to ADEM requirements by removing surface construction materials to below grade, filling the well casing with a cement bentonite grout mixture, and repairing the ground surface. Alternatively, the integrity of the supply wells may be evaluated using downhole video equipment. If the integrity of the supply well has been compromised, it will be abandoned according to the procedure described above. If the integrity of the supply well has not been compromised, then a steel plate will be welded to the steel outer well casing to ensure that the well can not be accessed and highly visible bollards will be installed surrounding the supply well.

An amendment to the RMP, summarizing the completion of these activities, will be submitted to the ADEM within 90 days of RMP approval.

8.0 References

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U.S. Geological Survey. 2008. Retrieved on March 11, 2008, from: http://infotrek.er.usgs.gov/traverse/f?p=NAWQA:HOME:1434499989136646

REFERENCE 10

NDD 140ck

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Send tax notice to:
Lenzing Fibers Inc.
12950 Highway 43, North
Axis, Alabama 36505
Attention: Mr. Kevin Allen

2009033385 Book-6537 Page-809
Total Number of Pages: 3

This instrument prepared by and after
recording return to:
Barry Andrews, Esq.
Lyons, Pipes & Cook, P.C.
2 North Royal Street
P.O. Box 2727
Mobile, Alabama 36652

Deed of Conveyance

STATE OF ALABAMA)

COUNTY OF MOBILE)

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS:

That in consideration of TEN and No/100 Dollars ($10.00 and other good and valuable consideration to the undersigned Grantor, in hand paid by the Grantee herein, the receipt whereof is acknowledged, **Mobile County, Alabama,** a political subdivision of the State of Alabama (herein referred to as Grantor), does hereby grant, bargain, sell, and convey unto **Lenzing Fibers Inc.,** a corporation incorporated under the laws of the State of Delaware (herein referred to as Grantee), the real estate, situated in Mobile County, Alabama, and described on Schedule A attached hereto and made a part hereof.

THIS CONVEYANCE IS MADE SUBJECT TO all easements, rights-of-way and other matters of record appearing of record in the Mobile County, Alabama Probate Court Records.

TOGETHER WITH ALL AND SINGULAR the rights, tenements, hereditaments, members, privileges and appurtenances thereunto belonging or in anywise appertaining.

TO HAVE AND TO HOLD to the said Grantee, its successors and assigns forever.

Grantor does for itself and for its successors and assigns covenant with the said Grantee, its successors and assigns, that it is lawfully seized in fee simple of said premises; that they are free from all encumbrances, unless otherwise noted above; that it has a good right to sell and convey the same as aforesaid; that it will and its successors and assigns shall warrant and defend the same to the said Grantee, its successors and assigns forever, against the lawful claims of all persons.

IN WITNESS WHEREOF, I have hereunto set my hand and seal, this the 28 day of May 2009.

Mobile County Commission

Mike Dean

Mike Dean, President

STATE OF ALABAMA)
)
COUNTY OF MOBILE)

I, the undersigned, a Notary Public in and for said County, in said State, hereby certify that Mike Dean, whose name as President of the County Commission of Mobile County, Alabama, a political subdivision of the State of Alabama, is signed to the foregoing instrument and who is known to me, acknowledged before me, on this day, that, being informed of the contents of such instrument, he, as such Chairman and with full authority, executed the same voluntarily for and as the act of said County.

Given under my hand and official seal, this the 28 day of May, 2009.

[NOTARIAL SEAL]

Melissa Barnett Chason
Notary Public

My Commission Expires: 8/14/2010

State of Alabama-Mobile County
I certify this instrument was filed on:
May 29, 2009 @ 1:18:31 PM

DEED TAX	$1,100.00
S.R. FEE	$2.00
SURCHARGE	$10.00
RECORDING FEES	$8.50
TOTAL AMOUNT	$1,120.50

2009033385
Don Davis, Judge of Probate

EXHIBIT "A"

Commencing at the Southwest corner of Section 18, Township 1 South, Range 1 East, Mobile County, Alabama; thence proceed along the West line of said section North 00 degrees 21 minutes 39 seconds East for a distance of 836.40 feet to a point; thence proceed in an Easterly direction along a bearing of North 89 degrees 31 minutes 39 seconds East for a distance of 1330.12 feet to a point; thence proceed North 63 degrees 01 minutes 39 seconds East for a distance of 1509.31 feet to a point on the West line of an Alabama Power Company easement; thence proceed in a Northerly direction along said easement along a bearing of North 00 degrees 28 minutes 21 seconds West for a distance of 1329.09 feet to a set 5/8" rebar being the Point of Beginning for the parcel described herein; thence proceeding in a counter-clockwise direction around said parcel continue along the West line of the Alabama Power Company easement along a bearing of North 00 degrees 28 minutes 21 seconds West for a distance of 277.99 feet to a point; thence run South 71 degrees 16 minutes 41 seconds West 1002.72 feet to a point; thence run South 00 degrees 00 minutes 00 seconds East 180.70 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East for 231.44 feet to a point; thence run South 00 degrees 20 minutes 45 seconds East for 270.79 feet to a point; thence run North 89 degrees 17 minutes 43 seconds East for 222.46 feet to a point; thence run North 00 degrees 00 minutes 00 seconds East for 187.43 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East for a distance of 84.00 feet to a point; thence run South 00 degrees 00 minutes 00 seconds West for a distance of 100.45 feet to a point; thence run South 43 degrees 32 minutes 08 seconds East for a distance of 54.45 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East 146.50 feet to a point; thence proceed North 00 degrees 00 minutes 00 seconds East 445.12 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East for a distance of 228.43 feet to the Point of Beginning. Said property lying entirely and being situated in Section 18, Township 1 South, Range 1 East, Mobile County, Alabama.

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Total Number of Pages: 3

STATE OF ALABAMA

COUNTY OF MOBILE

PARTIAL RELEASE OF LEASE AGREEMENT

FOR AND IN CONSIDERATION of the sum of ONE DOLLAR AND NO/100 ($1.00) and other good and valuable consideration, Industrial Development Authority of Mobile County, Alabama (previously known as Industrial Development Board of Mobile County, Alabama), does hereby RELEASE the following real property attached hereto as Exhibit A.

This Partial Release of Lease Agreement is delivered at the request of LENZING FIBERS INC., a Delaware corporation f/k/a TENCEL INC., as a successor in interest to COURTAULDS FIBERS, INC. ("Lenzing"), and pursuant to that certain Lease Agreement from the Industrial Development Board of Mobile County to Courtaulds Fibers, Inc., dated November 1, 1990, and recorded in Real Property Book 3644, Page 877 and supplemented in Real Property Book 4792, Page 855.

It is further understood and agreed that this Partial Release shall not be effective unless and until the closing of the transactions pursuant to the Purchase Agreement between Lenzing and Mobile County, Alabama, dated as of May 14, 2009.

All other terms and conditions of the aforesaid lease shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Partial Release as of May 14, 2009.

INDUSTRIAL DEVELOPMENT
AUTHORITY OF MOBILE COUNTY, AL

By: ____________________
J. Gary Cooper
Its: Chairman

LENZING FIBERS INC.

By: ____________________
Kevin Allen
Its: President

STATE OF ALABAMA

COUNTY OF MOBILE

I, a Notary Public, in and for said county and state, do hereby certify that J. GARY COOPER as, authorized representative of INDUSTRIAL DEVELOPMENT AUTHORITY OF MOBILE COUNTY, ALABAMA, and whose name is signed to the foregoing instrument, and who is known to me, acknowledged before me on this day that, being informed of the contents of such instrument, he executed the same voluntarily for and as the act of said AUTHORITY.

Given under my hand and official seal on this the 13 day of MAY, 2009.

Rechelle M Mattingly
NOTARY PUBLIC

My Commission Expires:
NOTARY PUBLIC STATE OF ALABAMA AT LARGE
MY COMMISSION EXPIRES: Feb 8, 2012
BONDED THRU NOTARY PUBLIC UNDERWRITERS

STATE OF ALABAMA

COUNTY OF MOBILE

I, a Notary Public, in and for said county and state, do hereby certify that Kevin Allen, as authorized representative of LENZING FIBERS INC., and whose name is signed to the foregoing instrument, and who is known to me, acknowledged before me on this day that, being informed of the contents of such instrument, he executed the same voluntarily for and as the act of said corporation.

Given under my hand and official seal on this the 13th day of May, 2009.

Tracy J Brown
NOTARY PUBLIC

My Commission Expires: 05-30-2012

State of Alabama-Mobile County
I certify this instrument was filed on:
May 29, 2009 @ 1:24:58 PM

S.R. FEE	$2.00
RECORDING FEES	$8.50
TOTAL AMOUNT	$10.50

2009033390
Don Davis, Judge of Probate

EXHIBIT "A"

Commencing at the Southeast corner of Section 13, Township 1 South, Range 1 West, Mobile County, Alabama; thence North 00 degrees 07 minutes 04 seconds West, along the East line of said Section 13, a distance of 836.40 feet to a concrete monument found (marked TB1); thence South 89 degrees 10 minutes 00 seconds West a distance of 270.00 feet to a point on the Western margin of the Southern Railway System (Norfolk Southern Corp.); thence North 00 degrees 50 minutes 00 seconds West, along said West margin, a distance of 650.00 feet to a capped rebar set at the point of beginning of the property herein described; thence South 89 degrees 09 minutes 54 seconds West a distance of 66.16 feet to a capped rebar set at the point of curvature of a 680.00 foot radius curve, concave Southeasterly; thence along the arc of said curve a distance of 484.40 feet (chord bears South 68 degrees 45 minutes 33 seconds West, 474.22 feet) to a capped rebar set at the point of tangency of said curve; thence South 48 degrees 21 minutes 00 seconds West a distance of 204.60 feet to a capped rebar set at the point of curvature of a 600.00 foot radius curve, concave Northwesterly; thence along the arc of said curve a distance of 415.17 feet (chord bears South 68 degrees 10 minutes 29 seconds West, 406.94 feet) to a capped rebar set; thence North 31 degrees 54 minutes 32 seconds West a distance of 160.78 feet to a capped rebar set on the East margin of U.S. Highway No. 43; thence North 00 degrees 07 minutes 23 seconds East, along said East margin a distance of 64.20 feet to a capped rebar set; thence South 89 degrees 52 minutes 37 seconds East a distance of 218.75 feet to a capped rebar set; thence North a distance of 280.67 feet to a capped rebar set; thence North 89 degrees 10 minutes 30 seconds East a distance of 904.53 feet to a capped rebar set on the West margin of the Southern Railway System (Norfolk Southern Corp.); thence South 00 degrees 50 minutes 00 seconds East, along said Western margin, a distance of 33.87 feet to the point of beginning.

REFERENCE 11

ENVIRONMENTAL STRATEGIES CONSULTING LLC
2025 Gateway Place, Suite 280 ▪ San Jose, CA 95110 ▪ (408) 453-6100 ▪ Fax (408) 453-0496

June 8, 2004

JUN 2004
RECEIVED
LAND DIVISION

Ms. Monique M. Miles
Site Assessment Unit #5
Environmental Assessment Section
Land Division
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, Alabama 36110

Re: Submittal of Voluntary Cleanup Plan Revision for the Former
<u>Acordis Cellulosic Fibers Inc. Facility Axis, Alabama - VCP Site No. 61-9329</u>

Dear Ms. Miles:

On behalf of Quanta Liability Transfer (QLT) and Former Acordis Cellulosic Fibers Inc. (Acordis), Environmental Strategies Consulting LLC (Environmental Strategies) is submitting three copies of the requested revision page for the referenced documents for your review and approval. The attached revision was prepared in response to the Alabama Department of Environmental Management's (ADEM) request dated June 8, 2004. Please remove the first page of Appendix A (Sampling Protocols) and insert the attached revision page.

We understand that ADEM will subsequently provide the opportunity for public comment. Upon completion of the public comment period, Environmental Strategies anticipates on implementing the approved plans.

If you have any questions or require additional information please do not hesitate to call.

Sincerely yours,

Richard E. Freudenberger

Richard E. Freudenberger
Senior Vice President

REF:bbb/mac

G:\$Archive\3900-4000\3971L.doc

enclosure

cc: John Stewart, Acordis Cellulosic Fibers Inc.
John Black, Environmental Strategies Consulting LLC
Lynn L. Bergeson, Esq., Bergeson & Campbell P.C.
Wayne Currie, Acordis Cellulosic Fibers Inc.

A QUANTA TECHNICAL SERVICES COMPANY

Sample Collection Procedures

All soil samples for TPHfs analysis will be collected using hand trowels. Soil samples for TPHfs analysis will be collected with a hand trowel, as follows:

- Place the blade tip of trowel into the soil and push firmly until a sampling depth of approximately three inches is reached.
- If sampling a stiff silty or clayey soil, it may be necessary to remove the trowel and reinsert it to further loosen the soil.
- When the soil has been sufficiently loosened, lift a portion of the soil out with the blade and place into the laboratory supplied containers.
- Label the sample, place in a cooler with ice as a preservative.

Composite Sample Collection Procedures

Composite soil samples will be collected using the following procedures.

- Based on chemical analysis, collect five sample containers as specified in Section 2.1.4 from four different locations within each 20 cubic yard component.
- Request on the chain-of-custody that the laboratory composite each of the five samples to form one sample and provide the appropriate chemical analysis.

Sampling Equipment Decontamination Procedures

Sampling equipment will be decontaminated before any sampling activity. The following decontamination procedure will be used for all sampling equipment:

- Place polyethylene sheeting on firm, flat surface during decontamination
- Mix solution of liquinox or equivalent detergent and tap water in bucket
- Wipe sampling equipment with paper towels to remove residual soils or gross contamination
- Disassemble sampling equipment
- Wash with liquinox or equivalent detergent
- Rinse with tap water
- Rinse with de-ionized water

All wastewater generated during equipment decontamination and steam cleaning will be contained and disposed of in accordance with applicable federal, state, and local regulations.

REFERENCE 12

ADEM

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
POST OFFICE BOX 301463 36130-1463 ◆ 1400 COLISEUM BLVD. 36110-2059
MONTGOMERY, ALABAMA
WWW.ADEM.STATE.AL.US
(334) 271-7700

JAMES W. WARR
DIRECTOR

BOB RILEY
GOVERNOR

Facsimiles: (334)
Administration: 271-7950
General Counsel: 394-4332
Air: 279-3044
Land: 279-3050
Water: 279-3051
Groundwater: 270-5631
Field Operations: 272-8131
Laboratory: 277-6718
Mining: 394-4326
Education/Outreach: 394-4383

June 22, 2004

CERTIFIED MAIL # 7003 3110 0004 0268 8304
RETURN RECEIPT REQUESTED

Mr. Richard E. Freudenberger, Senior VP
Environmental Strategies Corporation
2025 Gateway Place, Suite 280
San Jose, CA 95110

Re: ***Review of the Revised Voluntary Cleanup Plan***
Former Acordis Cellulosic Fibers Inc., Facility
Axis, Mobile County, Alabama
VCP Site No. 461-9329

Dear Mr. Freudenberger:

Personnel from the Environmental Assessment Section of the Alabama Department of Environmental Management (ADEM) have reviewed the Former Acordis Cellulosic Fibers Inc., Facility's revised Voluntary Cleanup Plan received on June 9, 2004, and have determined it to be complete. However, please be advised that the remedies cited in the Voluntary Cleanup Plan are required to be placed on public notice for a period of 30 days in order to meet the programmatic requirements contained in ADEM Admin. Code R 335-15-6. Acordis will be notified as to the date(s) and location(s) the plan will be available for public inspection.

Should you have any questions or comments, please contact Ms. Monique M. Miles at (334) 270-5638.

Sincerely,

Lawrence A. Norris, Chief for
Site Assessment Unit
Environmental Assessment Section
Land Division

MMM/LAN/ Acordis Cellulosic Fibers Inc.,

REFERENCE 13

ENVIRONMENTAL STRATEGIES CORPORATION
2025 Gateway Place, Suite 280 • San Jose, CA 95110 • (408) 453-6100 • Fax (408) 453-0496

VOLUNTARY CLEANUP PLAN
FORMER ACORDIS CELLULOSIC FIBERS INC. FACILITY
AXIS, ALABAMA

PREPARED
BY
ENVIRONMENTAL STRATEGIES CONSULTING LLC

OCTOBER 27, 2003

Reston, VA • Boxborough, MA • Minneapolis, MN • Cazenovia, NY • Durham, NC • Somerset, NJ • Denver, CO • Salt Lake City, UT • Moon Township, PA

Table of Contents

List of Figures:

List of Appendices:

1.0 Introduction

On behalf of Acordis Cellulosic Fibers Inc. (Acordis) and Mobile County (County), hereinafter collectively referred to as "Applicant," Environmental Strategies Consulting LLC (Environmental Strategies) prepared this Voluntary Cleanup Plan (Plan) in accordance with Alabama Department of Environmental Management (ADEM) Administrative Code Rule 335-15 for participation in the Brownfield Redevelopment and Voluntary Cleanup Program. This document presents a Plan that is based on the results of a Voluntary Property Assessment Report (Assessment) that details Stage I and Stage II soil and groundwater investigations performed at the former Acordis site (Property) in Axis, Alabama. The Assessment and the Plan address the entire Property. Specifically, the Plan focuses on those areas on the Property that were considered to require further action. This Plan includes all pertinent information as required in accordance with 335-15-4-.04 and is a companion document to the Assessment, submitted separately.

Based on the analytical data collected during the Stage I and Stage II soil and groundwater investigations, the following findings and recommendations are provided. Three areas have been identified as warranting voluntary remediation: the Fuel Oil Tanks, the Above Ground Diesel Tanks, and the Hydraulic Press Areas. A detailed Scope of Work for the Plan associated with Fuel Oil Tanks, Aboveground Diesel Tanks, and the Hydraulic Press Areas is provided in Section 2.0.

As part of the Plan, the following activities will also be conducted: soil removal and restoration of the Former Non-Hazardous Waste Landfill, the closure of the Sludge Lagoons and Decant Sump, quarterly groundwater monitoring of selected wells, abandonment of selected groundwater monitoring and production wells, and closure of the Fume Tunnel and a Basement area. These additional proposed activities are also described in Section 2.0.

Acordis is returning the Property to productive use; to this end, effective September 30, 2003, Acordis transferred ownership of the Property to Mobile County.

2.0 Voluntary Cleanup Plan

To obtain a "Letter of Concurrence" from ADEM, on behalf of the Applicant, Environmental Strategies prepared this Plan to address petroleum hydrocarbon impacted vadose zone soil at the Property as well as other environmentally related areas within the Property. This section describes in detail the methods for remediating the three areas affected by petroleum constituents: Fuel Oil Tanks, Above Ground Diesel Tanks, and Hydraulic Press (three pump rooms). The proposed scope of the remedial work is described including the objectives and cleanup criteria. All pertinent requirements are addressed. In addition, several other activities are also included in the Plan and are described in Sections 2.2 through 2.5. These activities involve addressing the Former Non-Hazardous Waste Landfill (Section 2.2); the closure of the Sludge Lagoons and Decant Sump (Section 2.3); quarterly groundwater monitoring of selected wells (Section 2.4); and abandonment of selected groundwater monitoring and production wells, and closure of the Fume Tunnel and a Basement area (Section 2.5).

A site-specific health and safety plan (HASP) will be developed before implementing any of the activities for the areas discussed below. The HASP will consist of a hazard assessment, including but not limited to chemical hazards, physical and mechanical hazards, safety procedures for excavating, personnel training requirements, monitoring, personal protective equipment, site control measures, decontamination procedures, and a contingency plan for emergencies. All on-site personnel will be required to adhere to the requirements outlined in the HASP.

2.1 Petroleum Contaminated Areas

Closure activities for the Fuel Oil Tanks, Above Ground Diesel Tanks, and the Hydraulic Press (three pump rooms) areas will involve excavation and off-site disposal of petroleum hydrocarbon impacted soils (Figure 2-1). Based on the Stage I and Stage II Assessments, it is estimated that the Fuel Oil Tank area will require an excavation of approximately 50 feet by 50 feet by 5 feet deep. The Above Ground Diesel Tanks area will require an excavation of approximately 40 feet by 30 feet by 8 feet deep. The Hydraulic Press Area (three pump rooms) will require an excavation of approximately 25 feet by 25 feet by 10 feet deep for each room. Environmental Strategies estimates that the Fuel Oil Tank area, Above Ground Diesel Tanks area, and the Hydraulic Press Area (three pump rooms) could generate approximately 700 tons, 533 tons, and 1,050 tons of material, respectively.

2.1.1 Cleanup Level

The proposed cleanup level for soil at the Property is 500 mg/kg for total petroleum hydrocarbons with a carbon chain range of C8 to C30 (TPHfs). This carbon chain range covers lighter fractions such as gasoline through heavy hydrocarbons such as fuel oil. The cleanup level of 500 mg/kg is based on Soil and Groundwater Screening Levels for Total Petroleum Hydrocarbons developed by California EPA - San Francisco Bay Regional Water Quality Control Board (RWQCB), July 2003. A copy of the Soil and Groundwater Screening Levels for Total Petroleum Hydrocarbons and a table titled "Direct Exposure Screening Levels for Residential Exposure Scenarios" are provided in Appendix A. This document is one chapter out of a series of seven chapters compiled to present environmental screening levels in the RWQCB document titled Appendix 1 Development of Tier 1 Lookup Tables. To minimize confusion and focus primarily on TPH impacted soil, Chapter 5 and the associated "Direct Exposure Screening Level" table, are provided. To view the entire "Appendix 1 Development of Tier 1 Lookup Tables," please refer to the following URL (http://www.swrcb.ca.gov/rwqcb2/esl.htm).

The RWQCB document is intended to help expedite the preparation of environmental risk assessments at sites where impacted soil and groundwater has been identified. As an alternative to preparing "site-specific" screening levels or attempting to quantify risk in a more formal risk assessment, data collected at a site can be directly compared to the Exposure Screening Levels (ESLs) or cleanup level and the need for additional work evaluated. This document is especially beneficial for use at small- to medium-size sites, where the preparation of a more formal risk assessment may not be warranted or feasible.

2.1.2 Supplemental Soil Investigation

Environmental Strategies will collect supplemental soil samples to further determine the horizontal and vertical extent of TPH impacted subsurface soil in the vicinity of the Fuel Oil Tank and Aboveground Diesel Tanks areas. Because each pump room in the Hydraulic Press area covers a small area, no further investigation is warranted. Verification sampling and analyses will be completed following the soil excavation.

A total of 48 soil samples from 16 borings will be collected from the Oil Tank and Aboveground Diesel Tanks areas. A limited access rig equipped with a GeoProbe®, EnviroCore®, or equivalent, will be used for the supplemental soil investigation. The majority of soil samples will be collected within the upper clay layer prominent in the unsaturated zone. Before commencing soil-sampling activities, all underground utilities will be located by reviewing available site as-builts.

An Alabama certified drilling company will perform all soil boring work. Soil borings will be lithologically logged using the USCS. The appropriate quantity of soil samples will be collected from each location at 5-foot intervals to a maximum depth of 15 feet below ground surface (bgs).

Soil sampling protocols are presented in Appendix B. All soil samples for chemical analyses will be collected using brass, stainless steel, or lexan sleeves. Sampling personnel will wear disposable nitrile gloves and change gloves before collecting each sample to prevent cross-contamination of the samples. The sleeves will be covered with teflon tape, capped and labeled. Each soil sample will be analyzed for TPHfs by EPA method 8015.

Upon completion of soil sample collection, the borehole will be backfilled with a cement bentonite grout. Each sampling location will be vertically and horizontally surveyed by an Alabama licensed surveyor and added to the existing Property figures and results added to the analytical database.

All downhole equipment will be steam cleaned using a portable steam cleaner before beginning each boring. All non-expendable equipment coming into contact with soil samples will be thoroughly cleaned before reuse in accordance with Appendix B of this Plan.

2.1.3 Excavation Procedures

The purpose of the excavations is to remove as much of the "source" hydrocarbons as possible. Based on previous investigations and historical site data, it is not expected that groundwater or saturated zone soils will be encountered during excavation. Soil verification samples will be collected to ensure that the cleanup level has been achieved.

The excavation for each area will require removal of an asphalt or concrete cover. The concrete and asphalt will be stockpiled on site. In addition to existing and new data obtained from the supplemental soil investigation, field-screening instruments such as a photo ionization detector (PID), or equivalent, in conjunction with visual documentation of staining will be used to direct the excavation. A field-screening criterion of sustained readings of 5 parts per million (ppm) above background levels from a PID will be used to guide the limits of the excavation. Laboratory testing performed on verification soil samples will provide confirmation of achieving the cleanup level.

It will likely be necessary to remove uncontaminated soil (overburden) to access underlying petroleum hydrocarbon impacted soil. Clean overburden material is expected to be present to a depth of approximately three feet bgs in the Fuel Oil Tanks and Aboveground Diesel Tanks areas. Based on analytical data from the Stage I and Stage II Assessments, hydrocarbon-impacted material appears to be present in subsurface soil beneath the concrete foundation at the three former pump rooms in the hydraulic press area.

Excavation slopes will be designed by an Alabama Licensed Professional Engineer. Excavation of TPH impacted material will progress until verification samples meet the cleanup level.

2.1.4 Transport and Disposal of Excavated Materials

All excavated soil and debris will be temporarily stockpiled on the Property. Three temporary stockpile locations (one for debris, one for clean overburden, and one for petroleum impacted soils) will be determined in the field. All excavated soils and debris will be stockpiled on, and covered with, plastic sheeting to minimize cross contamination of excavated soils and native soils.

Excavated soil determined to contain petroleum hydrocarbons will be transported using Department of Transportation (DOT) approved end dump trucks and disposed of under a non-hazardous waste manifest to an appropriately licensed and permitted disposal facility.

The clean overburden stockpiled material and concrete debris will be used as backfill upon completing the excavation activities. Asphalt debris will not be used as a source for backfill material. Additionally, clean overburden material generated during demolition from other areas of the Site may also be used for backfill. To verify that overburden material is below the cleanup level of 500 mg/kg for TPHfs, Environmental Strategies will collect composite samples. The overburden material to be used as backfill will be sampled approximately every 400 cubic yards (cy) (estimated in the field). The composite samples will be analyzed for TPHfs by EPA method 8015. Sample collection will be performed as described in Appendix B of this Plan.

2.1.5 Backfilling Procedures

A combination of uncontaminated overburden and clean off-site borrow material will be used as backfill and compacted in controlled lifts to 85 percent of the relative dry density (ASTM D1557, Modified Compactive Effort). The compaction will be certified to ensure backfilling is performed in accordance with applicable engineering standards. In the unlikely event that groundwater is present at the base of the excavation during backfilling, best engineering practices will be used to ensure the stability of emplaced material. In the Hydraulic Press area, the concrete slab will be replaced following excavation.

2.1.6 Soil Verification Sampling

Soil verification samples will be collected at the bottom and sidewalls of each excavation area and analyzed for TPHfs by EPA Method 8015. Verification samples will be collected only in unsaturated portions of each excavation in a 10-foot by 10-foot grid at the bottom of the excavation and every 10 feet along the mid-depth of the side walls. The verification samples will be analyzed on a 24-hour turnaround basis to minimize the time that excavation areas are left exposed. Each verification sample location will be flagged with the sample identification number. Before any of the excavation areas are backfilled, the sample locations will be measured from a fixed point and documented in a logbook.

All verification samples will be identified starting with "V." If an area is re-excavated because a verification sample exceeds the cleanup level of 500 mg/kg for TPHfs, an additional verification sample will be collected from the same horizontal location. The new verification sample will be identified with the original verification sample name followed by the letter "a." Consider the following example. A verification sample is collected and identified as "V2" (verification sample 2). The sample is sent to the lab for TPHfs analysis on a 24-hour turnaround basis. The next day, the sample results show the "V2" contains 900 mg/kg of TPHfs. Because this level exceeds the cleanup level for soil of 500 mg/kg, excavation of the area will continue. A new verification sample will be collected at the same horizontal location and designated as "V2a," indicating that the sample was collected after an initial verification sample had been collected. If the area requires additional excavation, then the next verification sample collected for that area would be identified as "V2b."

2.1.7 Schedule

Soil removal shall occur immediately following and be completed, weather permitting, not more than four months after the Property building demolition has been completed. A Certification of Compliance, stating that the areas addressed in this Plan have been remediated in accordance with the specifications of the approved Plan, will be submitted to the ADEM within 60 days of the completion of the soil removal.

2.2 Former Non-Hazardous Waste Landfill

In the Former Non-Hazardous Waste Landfill, partially exposed debris/non-hazardous waste is present at the surface in several areas. In 2004, the Applicant plans to voluntarily remove this debris/non-hazardous waste (primarily for aesthetic purposes) and then restore the cover and revegetate the area (Figure 2-1).

The activities that will be conducted at the Former Non-Hazardous Waste Landfill will include the following:

- Construction of a non-intrusive access road to allow mobility of small track-mounted equipment
- Removal of all protruding metal objects

- Placement of a minimum of 12 inches of soil over all areas of exposed debris that is non-metallic
- Revegetation or placement of pine straw mulch cover over all disturbed areas

These actions will be completed in a manner that does not destroy the root system of the existing trees. The surrounding areas will dictate the choice of vegetation and pine mulch. Areas of deep shade that cannot be vegetated will be mulched.

2.3 Closure of Sludge Lagoons and Decant Sump

Three phases of investigations, including an investigation of the sludge lagoon contents, demonstrate that the Sludge Lagoons and Decant Sump pose no concern for impacts to underlying soil and groundwater. The sludge lagoons have clay bottoms and compacted soil-cement walls. The embankments are stable, and as long as accumulated precipitation is removed, will contain all sludges previously deposited. In order to eliminate any potential safety concerns, perceived or otherwise, and to remove the potential for trespassers to access the lagoons, these units will be closed. The closure will reduce the potential for human and ecological exposure to constituents and eliminate the need to remove accumulated storm water from the lagoons. Per the schedule presented in Figure 2-3, the detailed design for the closure of the Sludge Lagoons and Decant Sump will commence in March 2004 and be completed by May 2004.

Environmental Strategies conducted an analysis of remedial alternatives following U.S. EPA guidance for conducting Feasibility Studies under CERCLA (USEPA 1998) and using criteria consistent with the National Oil and Hazardous Substances Contingency Plan (NCP). A range of remedial alternatives were evaluated, from No Action through the removal of the lagoon contents. Based on this evaluation, the Sludge Lagoons and Decant Sump will be closed with a composite soil cap using clean soils from either an onsite borrow source or an offsite borrow source. The capping alternative provides: 1) the highest overall protection of human health and the environment, 2) the best short-term effectiveness, 3) the best and most verifiable long-term effectiveness, and 4) reduced mobility of the sludge and constituents. The installation of a composite soil cap over the sludge lagoons will be effective in preventing exposure to contaminants through direct contact and inhalation, and would prevent any possible migration of constituents of the sludges. Negligible disturbance of the sludge will occur during implementation, minimizing odor generation.

This technology involves the recovery of free liquids from the lagoon surface and within the sludges. The free liquids covering the sludges primarily constitute precipitation and will be drawn off and routed through the on-site wastewater treatment plant for processing. Water ponded within low areas of the sludge surface and water within the sludges may contain suspended solids and process related constituents. These liquids will be filtered and pretreated, if necessary. The recovered liquids will be processed in the on-site wastewater treatment plant. Because the wastewater treatment plant was designed and built for Acordis' process operations, it is suited for the management of these liquids. Acordis has an agreement with Mobile County to use the wastewater treatment plant for this purpose.

Liquid within the sludge will be forced out by the weight of the engineered capping system and will be collected in the cap drainage system. The capping system will also prevent any reaccumulation of liquid in the lagoons.

The capping system will consist of three layers: an upper vegetative layer (topsoil), a drainage layer (sand), and a support layer (synthetic mesh and fill) (See Figure 2-2). Soils for the vegetative layer and the support layer would be obtained from a borrow pit located immediately south of the lagoons or elsewhere on the Property, or, alternatively, obtained from an offsite borrow source.

Approximately 100,000 cubic yards of fill will be placed over the two lagoons using earthmoving equipment. The construction of a capping system over the existing sludges will be accomplished using low ground pressure equipment and materials that can distribute the equipment loading over a relatively large area. To accomplish this objective, the lagoons will be covered with a high strength geosynthetic grid with a geotextile layer fused to the lower side. This material, ENKA Grid TRC (Appendix C), was developed to support roads over poor quality soils, the same loading scheme that is proposed for the lagoon closure. Each row of ENKA Grid will be anchored in the lagoon dikes. The ENKA Grid TRC will then be spread over the surface using floating platforms. The ENKA Grid panels will be tied together to form a continuous cover over each lagoon.

The liquids recovered from the sludges will be routed to the decant structure and subsequently to the wastewater treatment plant. A series of perforated pipes will be placed around and across the lagoons to allow the liquids to be captured and conveyed to the decant sump. A collection system will be designed for the decant sump to allow for settlement of the sludges and collection and treating of liquid samples to determine if pretreatment is required. The collection pipes will be placed directly on the ENKA Grid TRC and will originate at the decant sump, radiating out across the lagoon. The pipes will be covered with a 6- to 12-inch layer of porous media (sand or gravel) to protect the piping during placement of the cover and to increase their effective zone of capture.

The capping system will then be constructed from the perimeter toward the center. The first 40 to 50 feet (measured from the inside slope of the dike) of cover soil will be spread using long-reach hydraulic excavators. The materials will be placed until there is a uniform thickness perimeter of soil completely surrounding the sludges. This initial perimeter soil cover encloses 37 percent of the lagoons' surface area. The remaining cap will be sequenced to take advantage of the consolidation of the perimeter layer that will have taken place. The remainder of the first layer of the cover will be placed using front-end dump earth-moving equipment (Mustang dumps) and low ground pressure track-mounted dozers. The sequence and timing of the material placement is important.

Subsequent layers of the capping system will also be placed from the perimeter toward the center. This sequence ensures that the most consolidated materials are adjacent to the embankments and that there is more positive drainage toward the decant sump.

In addition to providing the weight required to move free liquids to the drainage system, the cap will divert runoff away from the closed lagoons. Liquid infiltration will be limited to the vegetative layer. Any liquids that do percolate through the vegetative layer will accumulate in the drainage layer and be conveyed away from the underlying sludge. The slope of the low permeability layer will be between 2 percent and 5 percent to prevent erosion (too steep) and eliminate pooling of rainwater (too flat). To maintain a goal of a final 3 percent slope, the initial capping system may have a slope up to 7 percent. The final slope will be determined based on settlement monitoring during construction. While a 7 percent slope is slightly steeper than desired from erosion potential criteria, this will allow for a settlement of 8 feet in the center of the lagoon while still maintaining an overall 3 percent slope. An inspection and maintenance program (to be developed as part of detailed design for composite cap) shall be implemented to ensure the integrity of the cap during and subsequent to significant settlement periods. The quarterly groundwater monitoring described in Section 2.4 of this Plan will verify continued protection of groundwater.

Preliminary design work for the closure of the lagoons is scheduled to begin late in March 2004, and closure will be completed in 2004. The overall schedule for the program activities is shown in Figure 2-3.

2.4 Quarterly Groundwater Monitoring

Quarterly groundwater monitoring will be performed at ten selected wells (MW-10, MW-12, MW-14, MW-16, MW-17, MW-18, MW-21, MW-22, MW-25, and MW-26) and the newly installed wells (MW-29, MW-30, MW-31, and MW-32) described above for a period of three years (Figure 2-1).

The initial quarterly monitoring event took place during the week of September 15, 2003. Results will be reported to ADEM in quarterly letter reports. After three years, an evaluation will determine if continued monitoring is warranted.

In the area of the Former Non-Hazardous Waste Landfill, upgradient well MW-21 and downgradient well MW-26 will be included in the monitoring program. In the Sludge Lagoon area, upgradient well MW-18 and downgradient well MW-17 will be monitored. MW-25 and MW-10, which are upgradient of the Rayon Plant and down gradient of the Tencel Plant, respectively, will also be monitored. At the northern property boundary, the two newly installed wells MW-29 and MW-30 will be included in the quarterly monitoring program. The southern property boundary will be monitored using MW-12, MW14, and MW-16 and the newly installed wells, MW-31 and MW-32. In addition, although there is no evidence to suggest that carbon tetrachloride and trichloroethene were used in production activities by Acordis, because they have been detected in MW-22, MW-22 will be monitored on a quarterly basis for three years. VOCs, SVOCs, metals, sulfates, and pH will be the parameters analyzed in all of these wells. Also, according to Acordis personnel, N-methyl morpholine oxide is used at the Tencel Plant, but not at the Acordis site. Thus, N-methyl morpholine oxide will be analyzed in MW-10, MW-18, MW-25, and MW-26.

The ongoing monitoring program for the Existing (operational) Non-Hazardous Waste Landfill will be continued under the requirements in the landfill permit; Mobile County will be responsible for compliance with these requirements.

2.5 Additional Activities

There are four areas of the facility that, while not environmental concerns, could pose a concern to the future occupants of the Property. Rather than let these conditions remain, they will be eliminated by taking the following actions:

- Abandon unnecessary monitoring wells
- Abandon Production Wells
- Fill Basement
- Fill Fume Tunnel

These activities are scheduled to occur during and following demolition activities in 2004.

2.5.1 Abandon Monitoring Wells

There are 17 monitoring wells on the Property that no longer serve any purpose. The following wells (listed and shown on Figure 2-1) will be overdrilled, the casings removed, and the resulting opening or borehole will be filled with cement-bentonite grout in accordance with ADEM requirements:

MW-11
MW-13
MW-19
MW-23
MW-24
MW-27
MW-28
OW-3
OW-5
OW-6
OW-8
OW-9
OW-10
SW-2
SW-3
SW-4
SW-5

2.5.2 Abandon Production Wells

There are five production wells on the Property that no longer serve any purpose. The casings of these wells will be perforated and the well casing and annulus will be grouted, according to ADEM requirements.

The following wells (listed and shown on Figure 2-1) will be abandoned:

PW-1
PW-2
PW-12
PW-14
PW-16

In addition, it may be necessary to abandon PW-11 if soils for lagoon closure are taken from the proposed area south of the lagoons.

2.5.3 Fill Basement

The former production facility basement apparently accumulates runoff and rainfall. Sampling of the accumulated water demonstrates that it poses no environmental concern. The presence of the below grade room presents a potential safety hazard and as such, the following actions will be completed:

- Remove the accumulated liquid and either treat in the County wastewater treatment plant or truck offsite for treatment/disposal
- Power wash the walls and floor, and accumulate and remove washing fluids for proper treatment/disposal

- Drill or break through (using a jackhammer or similar) the bottom slab at three locations
- Backfill the basement with clean crushed concrete debris to within 2 feet of the ground surface
- Place a geotextile over the crushed concrete
- Place soil over the geotextile and cover with a load-bearing concrete slab

The concrete fill will provide structural support, while the replacement slab will direct stormwater runoff away from the former recessed basement.

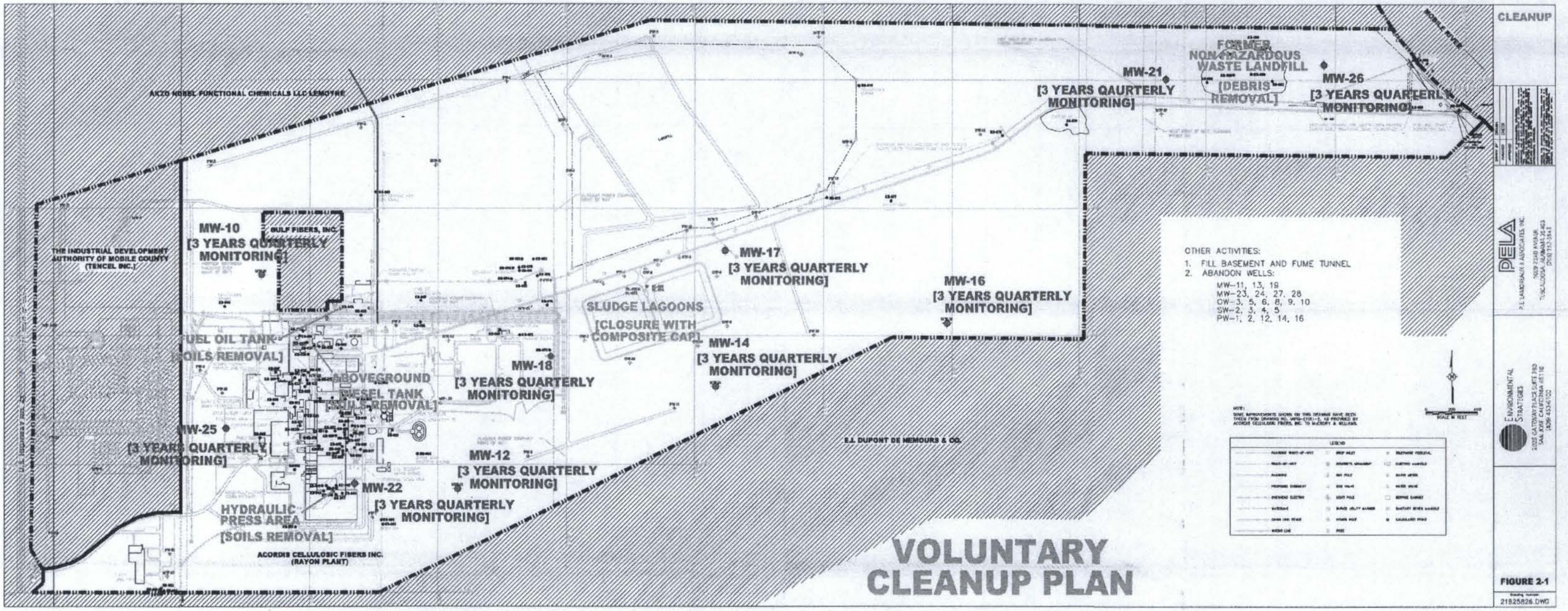
2.5.4 Fill Fume Tunnel

The former Fume Tunnel was used to collect air emissions from the rayon manufacturing process and is a large below ground tunnel within and continuing outside to the east of the main plant building. There is limited access and the tunnel could present a safety hazard to future occupants and trespassers. As such, the following actions at the Fume Tunnel area will be completed:

- Break open the top of the Fume Tunnel at each end and at one intermediate location
- Power wash the walls and floor, and accumulate and remove washing fluids for proper treatment/disposal
- Drill or break through (using a jackhammer or similar) the bottom slab at three locations
- Backfill the Fume Tunnel with clean crushed concrete debris to within 2 feet of the top of the tunnel
- Backfill the remaining void with flowable fill
- Place a geotextile over the crushed concrete and flowable fill at each of the openings
- Place a concrete slab over the openings

The concrete fill will provide structural support, while the concrete slabs will direct storm water runoff away from the openings.

Figures



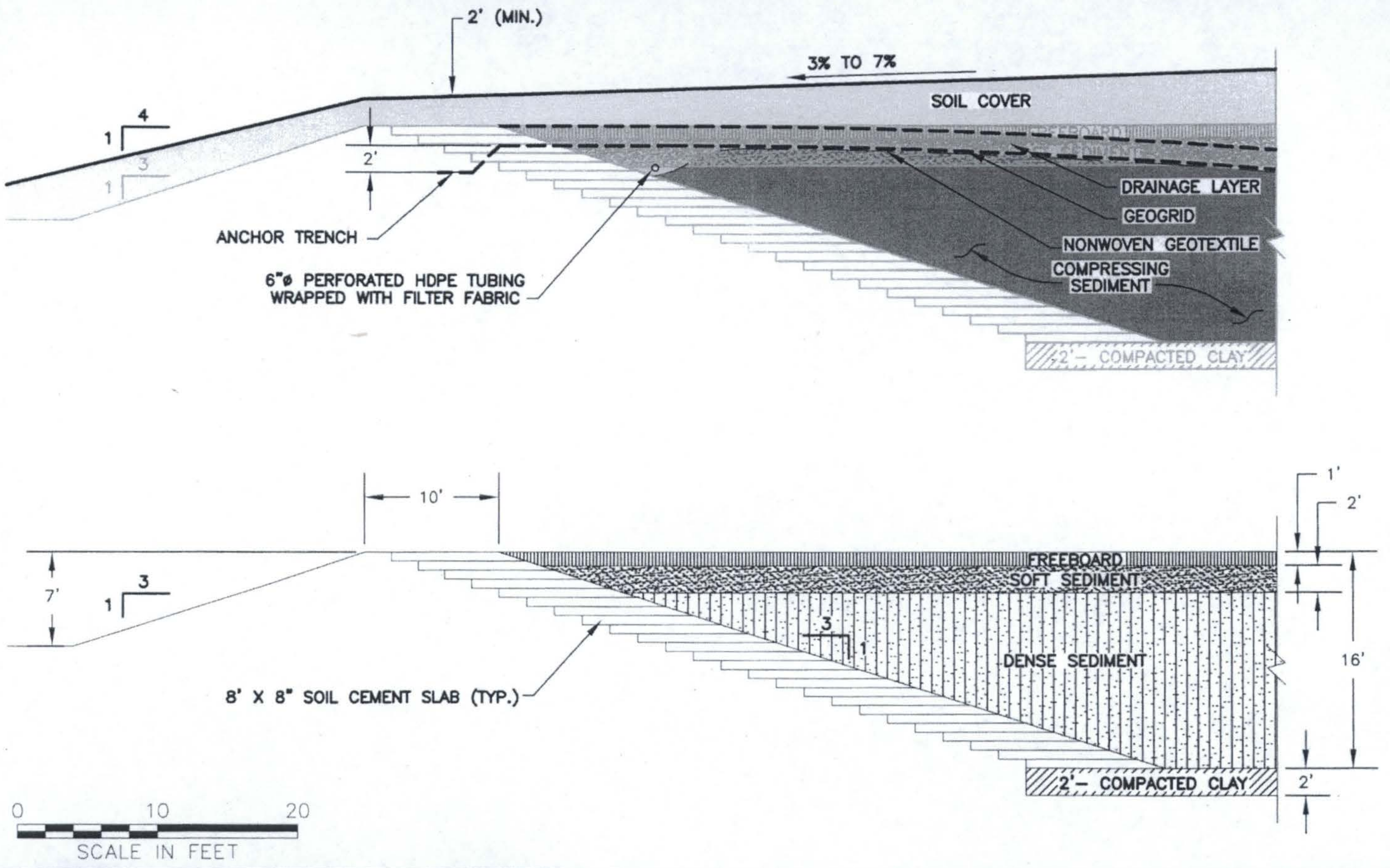
OTHER ACTIVITIES:

1. FILL BASEMENT AND FUME TUNNEL
2. ABANDON WELLS:
   MW-11, 13, 19
   MW-23, 24, 27, 28
   OW-3, 5, 6, 8, 9, 10
   SW-2, 3, 4, 5
   PW-1, 2, 12, 14, 16

NOTE:
SOME IMPROVEMENTS SHOWN ON THIS DRAWING HAVE BEEN TAKEN FROM DRAWING NO. [illegible], AS PROVIDED BY ACORDIS CELLULOSIC FIBERS, INC. TO McCRORY & WILLIAMS.

VOLUNTARY CLEANUP PLAN

FIGURE 2-1



ENVIRONMENTAL STRATEGIES
2025 GATEWAY PLACE SUITE 280
SAN, JOSE 95110
(408) 453-6100

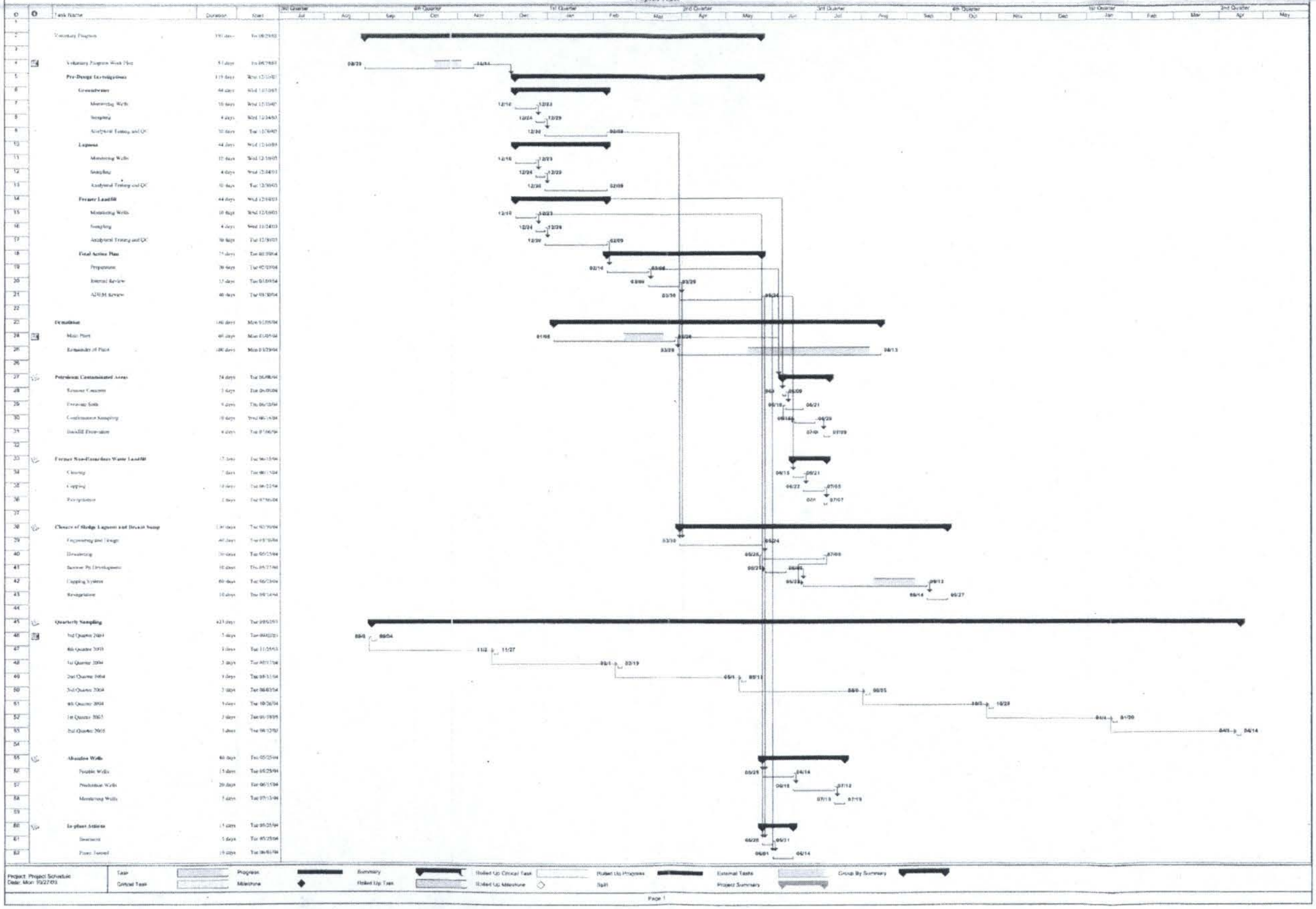
FIGURE 2–2

SCHEMATIC LAGOON CLOSURE

ACORDIS LAGOONS
ALABAMA
PREPARED FOR
ACORDIS
ALABAMA

Drawn By: JME
Checked:
Approved:
DWG Name: 21825821

Figure 2-3
Preliminary Schedule
Remedial Actions
Project Axis



ID		Task Name	Duration	Start
1				
2		Voluntary Program	[illegible] days	Fri 08/29/03
3				
4		Voluntary Program Work Plan	51 days	Fri 08/29/03
5		**Pre-Design Investigations**	119 days	Wed 12/10/03
6		**Groundwater**	44 days	Wed 12/10/03
7		Monitoring Wells	10 days	Wed 12/10/03
8		Sampling	4 days	Wed 12/24/03
9		Analytical Testing and QC	30 days	Tue 12/30/03
10		**Lagoons**	44 days	Wed 12/10/03
11		Monitoring Wells	10 days	Wed 12/10/03
12		Sampling	4 days	Wed 12/24/03
13		Analytical Testing and QC	30 days	Tue 12/30/03
14		**Former Landfill**	44 days	Wed 12/10/03
15		Monitoring Wells	10 days	Wed 12/10/03
16		Sampling	4 days	Wed 12/24/03
17		Analytical Testing and QC	30 days	Tue 12/30/03
18		**Final Action Plan**	75 days	Tue 02/10/04
19		Preparation	20 days	Tue 02/10/04
20		Internal Review	15 days	Tue 03/09/04
21		ADEM Review	40 days	Tue 03/30/04
22				
23		**Demolition**	140 days	Mon 01/05/04
24		Main Plant	60 days	Mon 01/05/04
25		Remainder of Plant	100 days	Mon 03/29/04
26				
27		**Petroleum Contaminated Areas**	24 days	Tue 06/08/04
28		Remove Concrete	3 days	Tue 06/08/04
29		Excavate Soils	5 days	Thu 06/10/04
30		Confirmation Sampling	10 days	Wed 06/16/04
31		Backfill Excavation	4 days	Tue 07/06/04
32				
33		**Former Non-Hazardous Waste Landfill**	17 days	Tue 06/15/04
34		Clearing	7 days	Tue 06/15/04
35		Capping	10 days	Tue 06/22/04
36		Revegetation	2 days	Tue 07/06/04
37				
38		**Closure of Sludge Lagoons and Decant Sump**	130 days	Tue 03/30/04
39		Engineering and Design	40 days	Tue 03/30/04
40		Dewatering	30 days	Tue 05/25/04
41		Borrow Pit Development	10 days	Thu 05/27/04
42		Capping System	60 days	Tue 06/22/04
43		Revegetation	10 days	Tue 09/14/04
44				
45		**Quarterly Sampling**	423 days	Tue 08/05/03
46		3rd Quarter 2003	3 days	Tue 08/05/03
47		4th Quarter 2003	3 days	Tue 11/25/03
48		1st Quarter 2004	3 days	Tue 02/17/04
49		2nd Quarter 2004	3 days	Tue 05/11/04
50		3rd Quarter 2004	3 days	Tue 08/03/04
51		4th Quarter 2004	3 days	Tue 10/26/04
52		1st Quarter 2005	3 days	Tue 01/18/05
53		2nd Quarter 2005	3 days	Tue 04/12/05
54				
55		**Abandon Wells**	40 days	Tue 05/25/04
56		Potable Wells	15 days	Tue 05/25/04
57		Production Wells	20 days	Tue 06/15/04
58		Monitoring Wells	5 days	Tue 07/13/04
59				
60		**In-place Actions**	15 days	Tue 05/25/04
61		Sediment	5 days	Tue 05/25/04
62		Plant Tunnel	10 days	Tue 06/01/04

Project: Project Schedule
Date: Mon 10/27/03

Task	▨	Progress	▬	Summary	▬	Rolled Up Critical Task	☐	Rolled Up Progress	▬	External Tasks	▨	Group By Summary	▬
Critical Task	☐	Milestone	◆	Rolled Up Task	▨	Rolled Up Milestone	◇	Split		Project Summary	▬		

Appendix A - Soil and Groundwater Screening Levels for Total Petroleum Hydrocarbons

Soil and Groundwater Screening Levels for TPH

Chapter 5 out of 7

(Complete Document Available at http://www.swrcb.ca.gov/rwqcb2/esl.htm)

Introduction

The selection of Total Petroleum Hydrocarbons (TPH) soil and groundwater screening levels for use in this document is described below. As discussed in the Volume 1, the use of environmental screening levels (ESLs) as final "cleanup levels" for petroleum-related compounds that are known to be highly biodegradable may be unnecessarily conservative. This is especially true for leaching based soil-screening levels for TPH and petroleum-related compounds. Final cleanup levels should be evaluated on a site-specific basis and in conjunction with guidance from the overseeing regulatory agency.

Petroleum is a complex mixture of hundreds of different compounds composed of hydrogen and carbon (i.e., "hydrocarbon" compounds). For the purposes of this document, petroleum mixtures are subdivided into "gasolines," "middles distillates" and "residual fuels," following the methodology used by the American Petroleum Institute (API 1994). Gasolines are defined as petroleum mixtures characterized by a predominance of branched alkanes and aromatic hydrocarbons with carbon ranges of C6 to C12 and lesser amounts of straight-chain alkanes, alkenes and cycloalkanes of the same carbon range. Middle distillates (e.g., kerosene, diesel fuel, home heating fuel, jet fuel, etc.) are characterized by a wider variety of straight, branched and cyclic alkanes, polynuclear aromatic hydrocarbons (PAHs, especially naphthalenes an methyl naphthalenes) and heterocyclic compounds with carbon ranges of approximately C9 to C25. Residual fuels (e.g., fuel oil Nos. 4, 5, and 6, lubricating oils, "waste oils," asphalts, etc.) are characterized complex, polar PAHs, naphthenoaromatics, asphaltenes and other high-molecular-weight, saturated hydrocarbon compounds with carbon ranges that in general fall between C24 and C40.

Laboratory analysis for TPH as gasolines and middle distillates is commonly carried out using EPA Method 8015 (or equivalent) modified for "gasoline-range" organics ("Volatile Fuel Hydrocarbons") and "diesel-range" organics ("Extractable Fuel Hydrocarbons"), respectively. Analysis for TPH as residual fuels up to the C40 carbon range can generally be carried out by gas chromatograph methods (e.g., Method 8015 modified for "motor oil" and "waste oil" range organics) but can also include the use of infrared or gravimetric methods. More detailed information on analytical methods for TPH and other chemicals can be obtained from environmental laboratories or the overseeing regulatory agency.

Laboratory measurement and assessment of each individual compound within a petroleum mixture is technically complex and generally not feasible or appropriate under most circumstances. More importantly, data regarding the physio-chemical and toxicity characteristics of the majority of petroleum compounds are lacking. Impacts to soil and water from petroleum mixtures are instead evaluated in terms of both TPH and well characterized "indicator chemicals" (e.g., benzene, toluene, ethylbenzene, xylenes and targeted PAHs). Indicator chemicals typically recommended for petroleum mixtures include (after CalEPA 1996):

Monocyclic Aromatic Compounds (primarily gasolines and middle distillates)

- benzene
- ethylbenzene
- toluene
- xylene

Fuel additives (primarily gasolines)

- MTBE
- other oxygenates as necessary

Polycyclic Aromatic Compounds (primarily middle distillates and residual fuels)

- methylnaphthalene (1- and 2-)
- acenaphthene
- acenaphthylene
- anthracene
- benzo(a)anthracene
- benzo(b)fluoranthene
- benzo(g,h,i)perylene
- benzo(a)pyrene
- benzo(k)fluoranthene
- chrysene
- dibenzo(a,h)anthracene
- fluoranthene
- fluorene

- indeno(1,2,3)pyrene
- naphthalene
- phenanthrene
- pyrene

The TPH ESLs should be used in conjunction with ESLs for these chemicals. Note that volatile chemicals such as butylbenzene, isopropyl benzene, isopropyl toluene and trimethylbenzenes are often reported in analyses of gasoline and other light-end petroleum products. These chemicals are collectively addressed under screening levels for "TPH" and generally do not need to be evaluated separately.

Soil and groundwater impacted by releases of waste oil may also require testing for heavy metals and chemicals such as chlorinated solvents and PCBs. Screening levels for these chemicals are included in the lookup tables.

TPH Screening Levels for Groundwater

Regulatory drinking water standards for TPH and petroleum in general have not been developed. For the purposes of this document, the TPH-diesel taste and odor threshold of 100 ug/L referenced in the technical document *A Compilation of Water Quality Goals* (RWQCBCV 2000) was used as the drinking water screening level for all categories of TPH (see Table F-3). Screening levels for benzene and related light-weight hydrocarbon compounds are considered to provide adequate additional protection of drinking water concerns for gasoline-impacted groundwater when used in conjunction with the TPH screening level of 100 ug/L. For the protection of aquatic life, a screening level of 500 ug/L was selected for TPH-gasoline in freshwater and 3,700 ug/L in saltwater (see Table F-4b). A single screening level of 640 ug/L was selected for TPH-diesel and TPH-residual fuels in both freshwater and saltwater. The freshwater screening level for TPH-gasoline is based on a summary of available eco-toxicity data compiled for use at the Presidio of San Francisco under Board Order 96-070 (RWQCBSF 1998b, Montgomery Watson 1999). The TPH-gasoline criteria for saltwater and the TPH criteria for diesel and residual fuels in general are based on screening levels developed for use at the San Francisco Airport under Regional Water Board Order No. 99-045 (RWQCBSF 1999a).

The groundwater ceiling level of 5,000 ug/L for TPH (all categories) noted in Table I was taken directly from Massachusetts DEP risk assessment guidance (MADEP 1997a,b). This also corresponds with the approximate solubility of diesel fuel and light motor oil in fresh water (ATSDR 2001a) and is intended to address potential nuisance issues (sheens, odors, etc.) if discharged to surface water, as required under the Basin Plan (RWQCBSF 1995). The solubility of gasoline in freshwater is approximately 150,000 ug/L. A ceiling level of 5,000 ug/L should therefore protect against the presence of a sheen in the absence of heavier range petroleum compounds.

TPH Screening Levels For Soil

TPH (gasolines, middle distillates)

Soil screening levels for lighter fractions of petroleum (gasolines, middle distillates) were selected based on a "surrogate" approach developed by the Massachusetts Department of Environmental Protection (Hutchinson et. al 1996; MADEP 1997a,b). The Massachusetts approach is similar to guidance developed by the Total Petroleum Hydrocarbon Working Group (TPHCWG 1998).

Massachusetts used six distinct groups of petroleum hydrocarbon compounds with similar carbon makeups and similar physio-chemical and toxicity characteristics to collectively describe the spectrum of all possible petroleum product mixtures (referred to as "carbon ranges"). For example, petroleum-related aromatic compound with five to 22 carbon atoms are grouped in the C11-C22 aromatic carbon range. Surrogate toxicity factors and physio-chemical constants were chosen for each carbon range group. These constants were then used to develop environmental soil and groundwater screening levels for each carbon range in the same manner as done for individual chemicals (see Section 2.0).

Due to the relatively high mobility of compounds included within the C11-C22 aromatics range fraction and the general predominance of these compounds in lighter-weight fuels, Massachusetts elected to use toxicity factors and physio-chemical constants for this carbon range as a "surrogate" for TPH in general. The same approach was adopted for use in this document. This could be potentially under conservative for gasoline-range mixtures with a predominance of more lighter and more mobile compounds. The use of conservative target indicator compounds (e.g., BTEX) in conjunction with the TPH screening level is assumed to adequately address this issue, however.

Massachusetts selected an oral and inhalation reference dose (RfD) of 0.03 mg/kg-d for the C11-C22 aromatics fraction, based on comparison to the Massachusetts RfD for pyrene. An RfD of 0.03 mg/kg-d is also used in the USEPA PRGs for pyrene (see table J). The TPH Working Group selected a slightly less conservative oral RfD of 0.04 mg/kg-d and inhalation RfD of 0.06 mg/kg-d (based on Reference Concentration of 0.20 mg/m^3) for the same carbon range group (THPWG 1998). In this document, the MADEP and USEPA RfD for pyrene of 0.03 mg/kg-d was used to generate direct-exposure soil screening levels for TPH under residential land use, occupational and construction/trench worker exposure scenarios (rounded to 500 mg/kg, 6,100 mg/kg and 22,000 mg/kg, respectively; refer to Tables K-1, K-2 and K-3). The screening levels are based on a target hazard quotient of 0.2.

Massachusetts developed generic physio-chemical constants for the C11-C22 aromatics carbon range fraction based on a review of compounds included within this fraction. These constants were adopted in this document to develop a soil leaching screening level for TPH as gasolines and middle distillates (see Table G). The TPH soil screening level calculated for protection of drinking water (rounded to 100 mg/kg) is coincidental with screening levels presented in other technical documents prepared by local regulatory agencies (RWQCBSF 1990; RWQCBLA 1996). Similarly, the soil screening level calculated for protection of surface water habitats (rounded to 500 mg/kg) is coincidental with the screening level developed for use in the Board Order for the San Francisco Airport (RWQCB 1999a).

Ceiling levels developed by Massachusetts for TPH as gasoline and diesel (latter included under "middle distillates") were modified for use in this document (MADEP 1997a,b, refer to Table H). For shallow soils, ceiling levels of 500 mg/kg and 1,000 mg/kg were selected for residential and industrial land-use scenarios, respectively. This is primarily based on odor and general nuisance concerns. For deep soils, a ceiling level of 5,000 mg/kg was retained (primarily intended to prevent the presence of significant, potentially mobile free product).

TPH (residual fuels)

Direct-exposure screening levels developed for TPH as gasoline and as middle distillates were retained for use with TPH as residual fuels (refer to Table K-1). Following Massachusetts DEP guidance (MADEP 1997a,b), ceiling levels of 500 mg/kg and 2,500 mg/kg were selected for residential and commercial/industrial shallow soils, respectively. The Massachusetts DEP ceiling level of 5,000 mg/kg was used for deep soils.

The Massachusetts DEP did not develop specific screening levels for leaching of heavy hydrocarbons from soil (refer to C19-C36 carbon range summary in Appendix 7). Residual fuels are by definition characterized by a predominance hydrocarbon compounds with carbon ranges greater than C24. These compounds are considered to be substantially less mobile in the subsurface that hydrocarbon compounds that make up the lighter-weight petroleum mixtures. For TPH that is characterized by a predominance of C23-C32 carbon range compounds, the Los Angeles Regional Water Board proposes a screening level of 1,000 mg/kg for protection of drinking water resources (RWQCBLA 1996). This screening level was adopted for use in this document (refer to Table G). The target TPH screening level for groundwater was not specifically stated but is presumably 100 ug/L or less.

The Los Angeles Regional Water Board did not present a similar screening level for potential leaching of TPH from soil and subsequent discharge of impacted groundwater to a body of surface water. Although conservative, the Los Angeles TPH soil-leaching screening level, 1,000 mg/kg, was retained for this purpose (see Table G, refer also to Section 3.2).

Appendix B - Sampling Protocols

Sample Collection Procedures

All soil samples for TPHfs analysis will be collected using hand trowels. Soil samples for TPHfs analysis will be collected with a hand trowel, as follows:

- Place the blade tip of trowel into the soil and push firmly until a sampling depth of approximately three inches is reached.
- If sampling a stiff silty or clayey soil, it may be necessary to remove the trowel and reinsert it to further loosen the soil.
- When the soil has been sufficiently loosened, lift a portion of the soil out with the blade and place into the laboratory supplied containers.
- Label the sample, place in a cooler with ice as a preservative.

Composite Sample Collection Procedures

Composite soil samples will be collected using the following procedures.

- Based on chemical analysis, collect five sample containers as specified in Section 2.1.4 from four different locations within each 400 cubic yard component.
- Request on the chain-of-custody that the laboratory composite each of the five samples to form one sample and provide the appropriate chemical analysis.

Sampling Equipment Decontamination Procedures

Sampling equipment will be decontaminated before any sampling activity. The following decontamination procedure will be used for all sampling equipment:

- Place polyethylene sheeting on firm, flat surface during decontamination
- Mix solution of liquinox or equivalent detergent and tap water in bucket
- Wipe sampling equipment with paper towels to remove residual soils or gross contamination
- Disassemble sampling equipment
- Wash with liquinox or equivalent detergent
- Rinse with tap water
- Rinse with de-ionized water

All wastewater generated during equipment decontamination and steam cleaning will be contained and disposed of in accordance with applicable federal, state, and local regulations.

Sample Documentation

Each sample will contain the following information on the label:

- client/job name
- Environmental Strategies sample identification number
- sample collection date and time
- sample analysis requested

All operations at the site will be recorded in the field notebook. Data recorded in the notebook will include meteorological conditions, personnel onsite, site activities, health and safety issues, estimated quantities excavated, number of trucks loaded, sampling procedures, sample identification numbers, sample collection date and time, and a sketch showing the sample locations with measurements.

The sampler will complete a chain-of-custody form to account for each sample. The chain-of-custody forms will contain the following information:

- project number
- sample ID numbers
- date and time of sample collection
- analysis requested for each sample
- name of sampling personnel
- date and time sample was relinquished
- When the samples are ready for shipment, the sampler will record the date and time on the chain-of-custody form before relinquishing the samples.

Sample Packaging and Shipment

Soil samples will be packed for shipment using the following procedures:

- Inspect the cooler used for shipment to determine that it is in good condition. If applicable, line the samples with bubble wrap or other packing material to minimize glass breakage. Place the samples in the cooler.
- Place a sufficient amount of ice packaged in plastic bags in the cooler to keep the samples chilled to 4°C during transit.
- Place the chain-of-custody form in a resealable plastic bag and affix to the inside of the cooler's lid.

Field QA/QC Procedures

The objective of quality control sampling is to provide a means for checking the accuracy and precision of the analytical results. QA/QC sample preparation will be identical to the collection of primary samples, as described above. A summary of the quality control samples to be collected is presented below.

Laboratory Quality Control Samples

Data from the MS/MSD sample is generated to determine long-term precision and accuracy of the analytical method on various matrices and to demonstrate acceptable compound recovery by the laboratory at the time of sample analysis. Matrix spike and matrix spike duplicate (MS/MSD) samples will be collected at a rate of approximately one MS/MSD per 20 primary samples or fraction thereof during the investigation and cleanup phases. Environmental Strategies will specify which sample(s) will be subject to MS/MSDs on the chain-of-custody.

Field Duplicates

Because of the inherent nature of matrix interference with soil samples, field duplicates will not be collected.

Equipment Blanks

To ensure that any non-dedicated soil sampling equipment used has been effectively cleaned, equipment blanks will be collected for analysis following decontamination. The sampling device will be filled with de-ionized water, the water will be transferred to a sample bottle, and the sample will be submitted to the laboratory for analysis. One equipment blank from the soil sampling equipment will be collected during the investigation and cleanup phases.

Appendix C – Enka Grid TRC

Appendix C – Enka Grid TRC

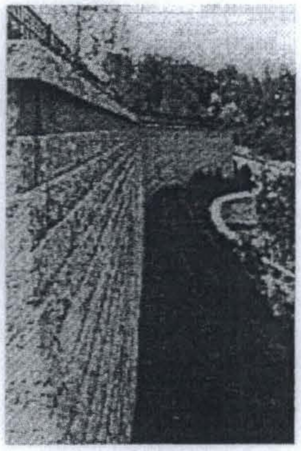
Enkagrid®

Technical Information

Click here for an EnkaGrid Case Study

Enkagrid PRO®

Description



Enkagrid PRO is a rigid uniaxial polyester geogrid for soil reinforcement. Enkagrid PRO is a "stripgrid" constructed from highly oriented extruded polyester strips and is suitable to reinforce most types of soil. Using laser technology the quality of the junction is precisely controlled during the production process creating consistently rigid junctions.

Enkagrid PRO reinforces the soil due to the innovative grid structure and its high soil-grid interaction coefficient. Enkagrid PRO delivers strength, performance and durability backed by years of expertise on polyester. The polymer orientation of the extruded strips creates a high stress-strain performance that suits engineers' needs for low deformation during and after construction. The highly oriented monolithic cross section of the strip offers long-term durability by reducing the installation damage, hydrolysis and alkaline attack. Extensive creep tests have proven the long-term working design loads.

Recommended Applications

- Steep slopes
- Vegetated walls
- Segmental block walls
- Steep bridge abutments
- Embankments on soft soil
- Reinforced working platforms
- Building and other structure foundations

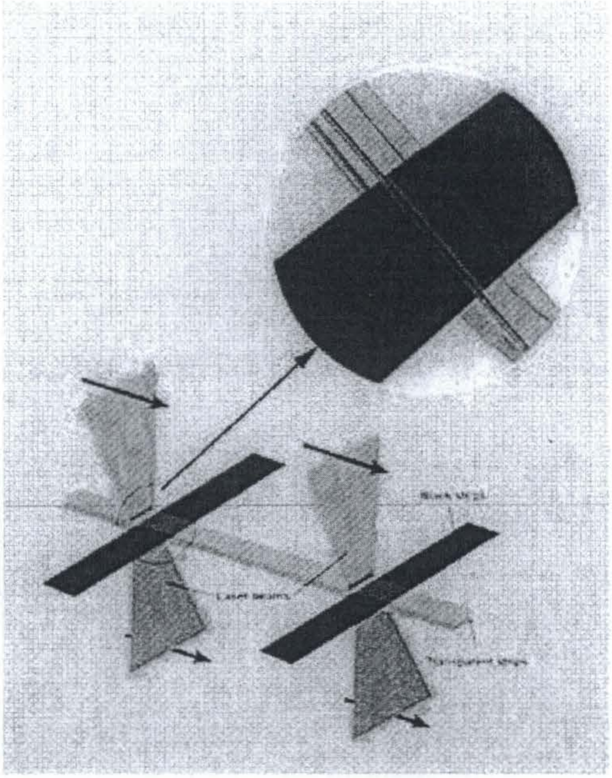
Features and Benefits

- Designed for maximum bearing capacity and shear resistance.
- Unique high-precision laser technology for consistent quality.
- Reinforcement for all soil types.
- A new combination of grid structure and polymers to create optimum soil-grid interaction.
- Excellent durability and long-term performance.
- Efficient and cost-effective coverage - 5m wide rolls.

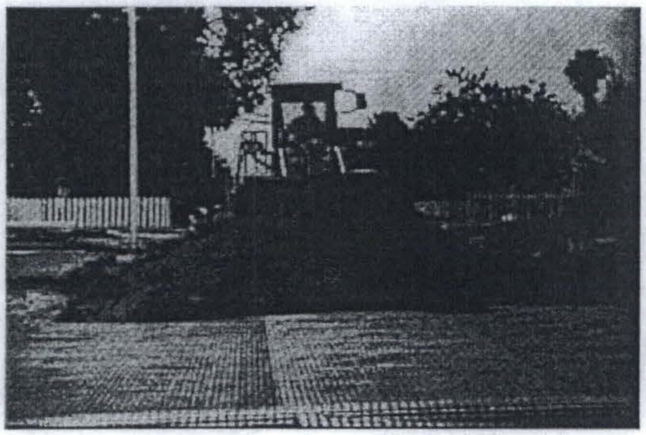
Installation Procedure*

**Please refer to the Enkagrid PRO installation guide or call a Colbond Geosynthetics representative at 1-800-365-7391 for technical assistance.*

Back to Top



Enkagrid MAX®



Description

Enkagrid MAX is a rigid biaxial polypropylene geogrid for stabilization of soil structures on low bearing capacity soils. Enkagrid MAX is a "stripgrid" and its innovative grid structure of highly oriented extruded polypropylene strips delivers increased passive bearing resistance and optimum interaction in all soil types. using laser technology the quality of the strip junction bond is precisely controlled during the production process creating consistently rigid junctions.

By stabilizing the base or subbase, Enkagrid MAX can reduce the granular fill material up to 30% and decreases construction time significantly. Enkagrid MAX is delivered on site in 5m-wide rolls and during installation the product is easy to handle. For structures with dynamic short-term loadings, Enkagrid MAX offers high strength with low strain.

Enkagrid MAX exhibits equal tensile strength in both longitudinal and transverse directions, making it most suitable for soil stabilization applications.

Recommended Applications

- Construction haul roads
- Paved roads
- Permanent unpaved roads
- Working platforms on weak subsoils
- Parking areas

Features and Benefits

- Designed for maximum bearing capacity and shear resistance.
- Efficient and cost-effective coverage - 5m wide rolls.
- High-precision laser technology for consistent quality.
- Reinforcement for all soil types.
- A new combination of grid structure and polymers to create optimum soil-grid interaction.
- Excellent durability and long-term performance.

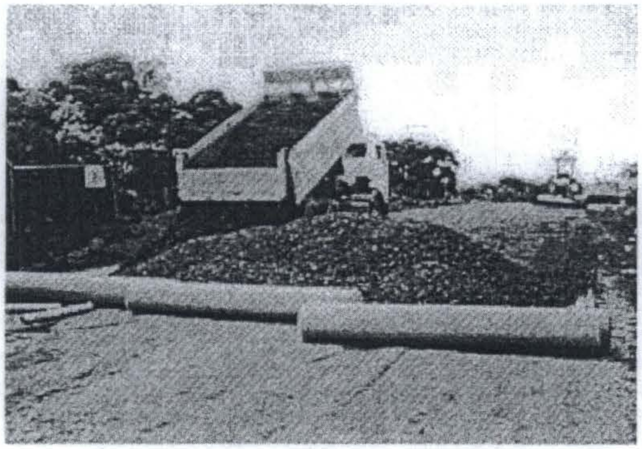
Installation Procedure*

1. Prepare the ground by removing stumps, boulders, etc. and fill in low spots.
2. Unroll the Enkagrid MAX directly over the ground to be stabilized, if more than one roll is required, overlap rolls. No longitudinal overlaps are allowed in the wheel paths.
3. Back dump the aggregate onto previously placed aggregate. Do not drive on the Enkagrid MAX. Maintain 150mm to 300mm cover between truck tires and geosynthetic.
4. Spread the aggregate over the Enkagrid MAX to the design thickness and fill any ruts with new aggregate.
5. Compact the aggregate by using a vibratory roller.

**Please refer to the Enkagrid MAX installation guide or call a Colbond Geosynthetics representative at 1-800-365-7391 for technical assistance.*

Back to Top

Enkagrid TRC®



Description

Enkagrid TRC is a multifunctional-geogrid made of a coated Twaron® aramid grid embedded in Colback®, a polyester nonwoven. This unique composite exhibits the properties of both a geogrid (reinforcement) and a nonwoven (separation and filtration.) The modulus of Enkagrid TRC substantially exceeds that of other polymeric geogrids and consequently tensile forces are mobilized at very low strains. Enkagrid TRC reduces the required thickness of a road sub-base subjected to traffic loads and prevents significant deformation of the sub-base, thus extending the service life of the road. Equal tensile strength in both longitudinal and transverse directions makes Enkagrid TRC ideal for base reinforcement and soil stabilization applications.

Recommended Applications

- Temporary or permanent construction of paved and unpaved roads.
- Embankments on weak subgrades.

Features and Benefits

- Reduces aggregate thickness - maintains adequate base section.
- Reduces settlement - increases modulus and stiffness of base section.
- Prevents cracking - reduces repair and maintenance costs while increasing life of road.
- Prevents pumping - separates aggregate base from weaker subgrade soils.
- Lightweight and flexible yet high survivability of installation stresses.
- Easy to handle rolls - quick and easy installation.
- UV protected by carbon black coated Twaron aramid grid.

Installation Procedure*

1. Prepare the subgrade by removing obstacles and leveling low spots. Compact to desired density if applicable.
2. Place Enkagrid TRC by unrolling in the direction of the roadway centerline or in a predetermined pattern for larger area coverage. (Overlap according to installation guidelines.)
3. Back dump the aggregate onto the Enkagrid TRC or place by using front-end loader. Driving directly on the Enkagrid TRC should be avoided.
4. Spread the aggregate using normal grading procedures using normal lift thickness (minimum lift thickness is 6 inches.) Fill and compact any ruts that may develop with new aggregate. (For extremely soft soils low bearing capacity equipment may be required.)
5. Compact the aggregate to required density.

**Please refer to the Enkagrid TRC installation guide or call a Colbond Geosynthetics representative at 1-800-365-7391 for technical assistance.*

Warranty

IN NO EVENT SHALL COLBOND, INC. BE LIABLE FOR CONSEQUENTIAL DAMAGES OR DAMAGES OF ANY KIND EXCEEDING THE SALE PRICE OF THE ENKAGRID TRC® FOUND TO HAVE BEEN DEFECTIVE. COLBOND MAKES NO WARRANTIES, EXPRESSED OR IMPLIED BY OPERATION OF LAW OR OTHERWISE INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSES OR END USE. INFORMATION CONTAINED HEREIN REGARDING APPLICATIONS OF ENKAGRID TRC® IS OF A GENERAL NATURE, AND SINCE CONDITIONS VARY WITH EACH SITE, COLBOND MAKES NO GUARANTEE OF RESULTS OR THE SUFFICIENCY OF THE INFORMATION CONTAINED HEREIN FOR THE USE CONTEMPLATED. Enkagrid TRC® is a registered trademark of Colbond B.V. and is covered by a number of U.S. patents. No license is granted or implied by these materials.

Back to Top

Back to Home Page

REFERENCE 14

November 5, 2010

NOV 8 2010

Ms. Crystal Collins
Redevelopment Section, Land Division
Alabama Department of Environmental Management
1400 Coliseum Blvd.
Montgomery, AL 36110

Re: Certification of Compliance
Brownfield Redevelopment and Voluntary Cleanup Program
<u>Former Acordis Cellulosic Fibers Facility, Axis, Alabama (ALRERA Site #461-9329)</u>

Dear Ms. Collins:

WSP Environment & Energy LLC, on behalf of QLT of Alabama LLC, is submitting this Certification of Compliance to document completion of the required remediation elements of the Voluntary Cleanup Plan (VCP, May 5, 2004) and the confirmation sampling elements from the Voluntary Property Assessment Report (VPAR, May 5, 2004) for the former Acordis Cellulosic Fibers, Inc. facility in Axis, Alabama. In accordance with Section 335-15-4-.06 of the Alabama Administrative Code under the Alabama Department of Environmental Management's (ADEM) Brownfield Redevelopment and Voluntary Cleanup Program, QLT of Alabama is requesting Letters of Concurrence (LOC) for the site. The LOCs will run to benefit both Acordis and Mobile County, applicants to the Voluntary Cleanup Program.

Since execution of the VCP in 2003, Mobile County has sold two parcels of the property, one to Lenzing Fibers, Inc. in May 2009 and one to Integra Water Creola, LLC in October 2008. These two parcels generally comprise the land occupied by the wastewater treatment plant. The enclosed draft environmental covenant that impose groundwater use restrictions exclude these two parcels that have been divested from the original Acordis property. In the event that all or part of the site are transferred before issuance of the LOCs or recording of the environmental covenants, Purchase Contracts will provide for any new owners to comply with the institutional restrictions to be placed on the property.

Background

In 2002 and 2003, WSP performed a comprehensive 2-stage soil and groundwater investigation of the entire property and documented the results in the VPAR. After completion of sampling and review of the investigation data, WSP recommended additional confirmation sampling in four areas of the site including the Former Non-PCB Transformer area, the Former PCB Transformer area, the Former Underground Gasoline Tank area, and Sodium Sulfate Loading area. The results of this additional investigation were documented in the Supplement to VPAR (June 29, 2006). Based on the sampling, only the Former Non-PCB Transformer area required remedial action.

After completion of the VPAR, WSP prepared a VCP that identified areas of the site that required further action and presented the remedial scope of work to address those issues. The VCP identified seven areas or issues that required remedial action including the Fuel Oil Tanks area, Above Ground Diesel Tanks area, Hydraulic Press area, and Hydraulic Rolls areas (collectively referred to as Petroleum Hydrocarbons Areas[1]); the Former Non-Hazardous Waste Landfill; the Sludge Lagoons

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[1] The Former Non-PCB Transformer area was added to the VCP scope after VCP submittal.

and Decant Sump; Site-wide Groundwater; Monitoring Well and Production Well Abandonment; the Basement; and the Fume Tunnel.

QLT of Alabama is requesting an Unconditional LOC for the Petroleum Hydrocarbon Areas (Hydraulic Rolls, Hydraulic Press, Fuel Oil Tanks, Aboveground Diesel Tanks, Former Non-PCB Transformer, Former PCB Transformer, and Former Underground Gasoline Tank), Monitoring and Production Well Abandonment, Basement and Fume Tunnel areas, and the Sodium Sulfate Loading Area.

QLT of Alabama is also requesting a Conditional LOC for the Former Non-Hazardous Waste Landfill, Sludge Lagoons, and Site-wide Groundwater.

A fourth element of the Conditional LOC, the Former Septic Tank area, was investigated subsequent to VCP submittal and has been accepted by the ADEM. QLT of Alabama understands that an environmental covenant is required for areas that required engineering or institutional controls as part of the approved remedy. The Former Non-Hazardous Waste Landfill and Sludge Lagoons required engineering controls under the approved VCP and will be combined on a single environmental covenant. The Former Septic Tank and Site-wide Groundwater require institutional controls and will be included on a single environmental covenant as requested by the ADEM (June 14, 2010).

Mobile County is the Grantor listed on the enclosed environmental covenants. While included with this Certification of Compliance, Mobile County is the author of the environmental covenants. Any future questions and comments regarding the covenants should be directed to Mr. Bill Melton of Mobile County and copied to QLT of Alabama and WSP.

The following sections provide a brief summary of each major task with a request for Conditional or Unconditional LOC, as appropriate. A summary table of the program deliverables, submittal dates, and ADEM approval dates (if applicable) is presented in Enclosure 1.

Petroleum Hydrocarbon Areas

WSP prepared a Total Petroleum Hydrocarbon (TPH) Soil Excavation Work Plan (July 5, 2006) that was approved by the ADEM on October 6, 2006. The work plan identified five areas as containing TPH above Corrective Action Level (CAL) of 100 parts per million (ppm): 1. Fuel Oil Tanks area, 2. Above Ground Diesel Tanks area, 3. Hydraulic Press area, 4. Hydraulic Rolls area, and 5. Former Non-PCB Transformer area. All soil containing greater than 100 ppm was excavated and transported for offsite disposal in January through March 2007. Confirmatory sampling was conducted in two additional areas, 1. Former Underground Gasoline Tank area, and 2. Former PCB Transformer area, as specified in the VPAR. Soil samples from these areas did not exceed the 100 ppm threshold. The January 21, 2008 completion report was accepted by ADEM on February 29, 2008. QLT of Alabama requests these seven TPH areas be included on the Unconditional LOC.

Sludge Lagoons Closure

WSP prepared a Sludge Lagoon Closure Design Report (July 6, 2005) that included the work plan for closure activities. The two wastewater treatment sludge lagoons were closed by constructing a multi-layer composite capping system and installing surface water drainage controls. The Sludge Lagoon closure work began in July 2005 and was substantially completed with the final permanent seeding in May 2008. The closure work was documented in the Sludge Lagoons and Former Non-Hazardous

Waste Landfill Completion Report (June 25, 2009). The report was approved by the ADEM on July 9, 2009.

Because engineering controls were required for closure, QLT of Alabama requests the Sludge Lagoons be included on the Conditional LOC. A draft environmental covenant is included in Enclosure 2. The Sludge Lagoons are also subject to long-term operation and maintenance (O&M). The Sludge Lagoons O&M requirements are discussed later in this report.

Former Non-Hazardous Waste Landfill

The work plan for closure of the Former Non-Hazardous Waste Landfill was included in the Sludge Lagoon Closure Design Report (July 6, 2005). The Former Non-Hazardous Waste Landfill closure was capped in January 2006 and over seeded in May 2008. The closure work was documented in the Sludge Lagoons and Former Non-Hazardous Waste Landfill Completion Report (June 25, 2009) which was approved by the ADEM on July 9, 2009. Because engineering controls were required for closure, QLT of Alabama requests the Former Non-Hazardous Waste Landfill be included on the Conditional LOC. The draft environmental covenant is included in Enclosure 2. Long-term O&M will be performed for the Former Non-Hazardous Waste Landfill area. The O&M requirements are discussed later in this report.

Groundwater Monitoring

QLT of Alabama completed twelve quarters of groundwater monitoring in September 2007. After each quarterly sampling event, WSP prepared a groundwater monitoring report that was subsequently approved by the ADEM. Based on results of three years of quarterly monitoring, WSP submitted a Risk Management Plan (RMP) for groundwater on May 22, 2008. ADEM's review of the RMP led to additional sampling in and around the former septic tank. The septic tank investigation report with updated risk assessment analysis was submitted on July 15, 2009. After QLT of Alabama responded to additional comments, the ADEM approved the reports on May 4, 2010, pending the public review period. In a letter dated June 14, 2010, ADEM informed QLT of Alabama that no public comments were received and that a draft environmental covenant must be submitted prior to the LOC being issued. QLT of Alabama requests the Site-Wide Groundwater be included on the Conditional LOC because institutional controls are required. A draft environmental covenant (Enclosure 3) includes a prohibition on the use of groundwater, a restriction that the property may be used only for commercial or industrial uses, and a notification that the septic tank has been left in place and no land disturbance is permitted in this area.

Well Abandonment

The VCP property includes 16 production wells[2]. Five of the 16 plant production wells and 15 monitoring wells were abandoned in accordance with the VCP in December 2004. The report documenting well abandonment was included with the Groundwater Monitoring Program Quarterly Report #1 of 12 submitted to ADEM on May 12, 2005. The report was approved by the ADEM in a letter dated January 24, 2006.

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[2] Three of Acordis' original 19 production wells are located on a parcel that was transferred to Tencel, Inc. before execution of the VCP and, therefore, are not part of this program.

A RMP was submitted in connection with site-wide groundwater (see section above). The RMP concluded that human exposure to groundwater should be eliminated. There are 9 production wells remaining on the property, of which, 8 production wells are the responsibility of Mobile County. The one remaining well, PW-11, was closed by QLT of Alabama on July 27 and 28, 2010, to prevent future human exposure to groundwater. QLT of Alabama requests the Monitoring and Production Well Abandonment work be included on the Unconditional LOC.

Basement and Fume Tunnel

The Basement and Fume Tunnel posed no environmental concern; however, the below grade features were potential safety hazards to future site occupants. The Basement and Fume Tunnel were closed in 2004. A report detailing the closure activities is included in Enclosure 4. QLT of Alabama requests these areas be included on the Unconditional LOC.

Former Sodium Sulfate Loading Area

The Former Sodium Sulfate Loading area was the only non-petroleum area included in the VPAR confirmatory sampling program. WSP performed the sampling and summarized the results in the Supplement to VPAR (June 29, 2006). The Supplement to VPAR letter did not identify any constituent that exceeded any regulatory threshold; however, the letter indicated that discolored surface soils would be removed for aesthetic purposes. On September 28, 2006, WSP submitted a request for no further action for the Sodium Sulfate Loading area because the discolored soils were no longer present in quantities that justified removal for aesthetic purposes. The ADEM approved the report on November 16, 2006. QLT of Alabama requests the Former Sodium Sulfate Loading area be included on the Unconditional LOC.

Operation and Maintenance

The Sludge Lagoons and Former Non-Hazardous Waste Landfill required engineering controls to contain or control migration of contaminants through the environment. Periodic O&M of these areas is required to ensure that the Sludge Lagoon caps and drainage controls and the Former Non-Hazardous Waste Landfill cover maintain integrity and long-term effectiveness. In accordance with the VCP, QLT of Alabama will perform up to three years of inspections, monitoring, and repairs of the capping systems and drainage controls. An O&M Plan (Enclosure 5) has been prepared to provide instruction and guidance for QLT of Alabama and their contractors for the 3-year O&M period under the VCP. The O&M Plan covers the inspection and maintenance requirements for erosion, settlement, vegetation, leachate collection system, and drainage controls.

Over two years of O&M activities have been performed since substantial completion of the Sludge Lagoons and Former Non-Hazardous Waste Landfill in May 2008. Enclosure 6 documents post-closure O&M work completed from May 2008 to May 2010. QLT of Alabama proposes to continue the inspection and maintenance program in accordance with the O&M Plan until March 2011. The first inspection was performed on June 29, 2010, and the second inspection on September 29, 2010. Subsequent inspections will be in December 2010 and March 2011. WSP will perform the last of the three scheduled annual topographical surveys in March 2011.

After March 2011, site owners and future users of the property will not be obligated to follow the O&M Plan prepared by WSP; however, they will be required to meet the requirements of the environmental covenants. Site owners and future users may prepare and implement their own plans to meet the covenant requirements.

Conclusion

With the exception of ongoing O&M activities, QLT of Alabama has completed the proposed remedial work described in the VCP and the additional sampling stated in the VPAR. Completion documentation has been submitted to and approved by the ADEM as work elements were performed. In summary, QLT of Alabama requests an Unconditional LOC for the seven Petroleum Hydrocarbon areas, Monitoring and Production Well Abandonment, the Sodium Sulfate Loading area, and the Fume Tunnel and Basement Areas. A Conditional LOC is requested for the Sludge Lagoons, Former Non-Hazardous Waste Landfill, Site-wide Groundwater, and the Septic Tank area. The LOCs shall run to benefit the VCP applicants, Acordis and Mobile County. Environmental covenants for the Conditional LOCs are enclosed. QLT of Alabama will continue O&M activities for the Sludge Lagoons and Former Non-Hazardous Waste Landfill through March 2011.

As required by Fee Schedule H of Chapter 335-1-6 of the Alabama Code, WSP has enclosed two checks in the amounts of $785 and $1,965 for ADEM's review and issuance of the two LOCs. WSP and QLT of Alabama appreciate the ADEM's efforts in bringing this project to closing. If you have any questions regarding this Certification of Compliance, the requested LOCs, or the enclosed information, please do not hesitate to contact WSP or QLT of Alabama. Questions or comments concerning the environmental covenants should be directed to Mr. Bill Melton of Mobile County and copied to WSP and QLT of Alabama.

Sincerely yours,

Richard E. Freudenberger

Richard E. Freudenberger
Vice President

Enclosures

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cc: John Manzi, QLT of Alabama LLC
John Stewart, Acordis Cellulosic Fibers, Inc.
G. William Melton, Mobile County
Barry Andrews, Phelps Dunbar LLP
Reynolds Renshaw, Renshaw Consulting Group LLC
John Black, WSP Environment & Energy LLC

Enclosure 1

Enclosure 1

Voluntary Program Component	Design/Work Plans		Period of Performance	Completion/Final Report		Component Includes
	Submittal Date	ADEM Approval		Submittal Date	ADEM Approval	
Voluntary Property Assessment Report (VPAR)	June 11, 2004	August 12, 2004	Not Applicable	Not Applicable	Not Applicable	Site assessment activities
Voluntary Cleanup Plan (VCP)	June 8, 2004	August 12, 2004	Not Applicable	Not Applicable	Not Applicable	General framework of voluntary program obligations
Petroleum Contaminated Areas	July 5, 2006	October 6, 2006	January to March 2007	January 21, 2008	February 29, 2008	Excavation, segregation, and offsite disposal of soils containing total petroleum hydrocarbons (TPH) above 100 ppm from 5 areas of the site; verification sampling, backfilling, and site restoration
Former Non-Hazardous Waste Landfill	July 6, 2005	Not Received	December 2006	June 25, 2009	July 9, 2009	Removal of metal objects, consolidation of exposed debris, placement of 12 inches of soil cover, revegetation of disturbed areas
Closure of Sludge Lagoons and Decant Sump	July 6, 2005	Not Received	July 2005 to March 2009	June 25, 2009	July 9, 2009	Removal of free liquids from lagoons, placement of seamed geotextile panels, construction of multi-layer capping system, revegetation, and borrow pit management, drainage improvements
Quarterly Groundwater Monitoring	June 8, 2004 (with VCP)	Not Applicable	November 2004 to September 2007	May 22, 2008 (Risk Management Plan)	May 4, 2010	Quarterly sampling for three years of 16 monitoring wells and quarterly reports
Well Abandonment	June 8, 2004 (with VCP)	Not Applicable	November 1, 2004	May 12, 2005	January 24, 2006	Abandonment of 15 monitoring wells and 5 production wells
Fill Basement and Fume Tunnel	June 8, 2004 (with VCP)	Not Applicable	October to December 2004	November 5, 2010 (with Certification of Compliance)	Pending	Removal of free liquids, pressure washing floors and walls, filling subgrade cavities with concrete rubble from demolition, and restoring surface
Confirmatory Sampling	June 11, 2004 (with VPAR)	Not Received	October 2004	June 29, 2006 (Supplement to VPAR)	Not Received	Additional sampling described in the VPAR - former PCB and non-PCB transformers, underground gasoline tank, and sodium sulfate loading areas
Sodium Sulfate Loading Area	Sept 28, 2006	Not Received	October 2004 to September 2006	Sept 28, 2006	November 16, 2006	Confirmatory soil sampling and test pit installation
Septic Tank Area Investigation	February 20, 2009	March 23, 2009	April 1, 2009	July 17, 2009	May 4, 2010	Soil sampling near septic tank and leach field
Operation and Maintenance Plan	November 5, 2010 (with Certification of Compliance)	Pending	April 2008 to March 2011	Not Applicable	Not Applicable	Inspection and Maintenance Requirements for Sludge Lagoons and Former Non-Hazardous Waste Landfill

REFERENCE 15

Deputy Public Works Director/
Assistant County Engineer
John E. Murphy Jr., P.E.

Environmental Services Director
G. William Melton, P.E.

Traffic Manager
James D. Foster

Design Engineering Manager
W. Bryan Kegley II, P.E., P.L.S.

Construction Engineering Manager
James Vorpahl, P.E.

Economic Development Engineering Manager
Richard A. Mitchell, P.E.

MOBILE COUNTY PUBLIC WORKS
Director of Public Works / County Engineer
Joe W. Ruffer, P.E.

Mobile Government Plaza
205 Government Street
Mobile, Alabama 36644-1600

Phone: (251) 574-8595
Fax: (251) 574-4722

JUN 28 2011

June 24, 2011

Crystal L. Collins
Senior Environmental Scientist, Redevelopment Section
Environmental Services Branch
Alabama Department of Environmental Management
1400 Coliseum Blvd
Post Office Box 301463
Montgomery, Alabama 36130-1463

RE: Acordis LOC-461-9329
Recorded Environmental Covenants

Dear Ms. Collins:

As per our correspondence, enclosed you will find the two fully executed, recorded, Environmental Covenants to be referenced in, and included with, the Letter of Concurrence for the Acordis project. This package includes one original and one copy of each covenant. It is my understanding that submittal of these recorded covenants is the final step required to receive the Letter of Concurrence for the former Acordis site.

We appreciate your assistance and look forward to closing out this project. Should you have any questions or require additional information, please don't hesitate to contact me at 251.574.3229.

Kind Regards,

G. William Melton

G. William Melton
Environmental Services Director

Enclosures: 4

2011045259 Book-6806 Page-1741
Total Number of Pages: 61

153.50
2.00
155.50

STATE OF ALABAMA

COUNTY OF MOBILE

THIS INSTRUMENT PREPARED BY AND
TO BE RETURNED TO:

T. Bruce McGowin (Hand Arendall LLC)
c/o Tina Sanchez
Mobile County Engineering
205 Government Street, 6th Floor
Mobile, AL 36644-1600

Note to Filing Clerk: **INDEX UNDER MOBILE COUNTY, ALABAMA, AS PROPERTY OWNER AND GRANTOR**

NOTICE OF FILING OF CONDITIONAL LETTER OF CONCURRENCE, CERTIFICATE OF COMPLIANCE AND ENVIRONMENTAL COVENANTS

This Notice is filed pursuant to ADEM Admin. Code R. 335-15-4-.06(4).

Attached to this Notice are true and correct copies of:

1. Letter of Concurrence issued July 25, 2011 by the Alabama Department of Environmental Management ("ADEM") to Mobile County, Alabama ("Mobile County") and Acordis Cellulosic Fibers, Inc. ("Acordis").

2. Certificate of Compliance dated November 5, 2011 submitted by WSP Environment & Energy, LLC on behalf of QLT of Alabama, LLC to ADEM.

3. Environmental Covenants with Mobile County as Grantor dated April 18, 2011, filed at Book 6789, Page 290 of the records in the Office of the Judge of Probate of Mobile County, Alabama.

4. Environmental Covenants with Mobile County as Grantor dated April 18, 2011, filed at Book 6789, Page 303 of the records in the Office of the Judge of Probate of Mobile County, Alabama.

Done in Mobile, Alabama, this 15th day of August, 2011.

State of Alabama-Mobile County
I certify this instrument was filed on:
August 24, 2011 @ 3:04:40 PM

S.R. FEE	$2.00
RECORDING FEES	$153.50
TOTAL AMOUNT	$155.50

2011045259
Don Davis, Judge of Probate

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2011034114 Book-6789 Page-303
Total Number of Pages: 10

ENVIRONMENTAL COVENANT
(Site Wide Restrictions)

The County of Mobile (hereinafter "Grantor" or "Owner") grants an Environmental Covenant (hereinafter "Covenant" or "Environmental Covenant") this 18th day of April, 2011, pursuant to The Alabama Uniform Environmental Covenants Act, Ala. Code §§ 35-19-1 to 35-19-14 (2007 Cum. Supp.) (hereinafter "the Act" or "Act"), and the regulations promulgated thereunder:

WHEREAS, the Grantor is the owner of certain real property identified as the former Acordis Cellulosic Fibers, Inc. ("Acordis") facility situated at 12740 U.S. Highway 43 North, in Mobile County, Alabama as described on Exhibit A (hereinafter "the Property"), which Property was conveyed to Grantor by deed dated September 30, 2003, and recorded in the Office of the Judge of Probate for Mobile County, Alabama, in Deed Book 5467 at Page 0330;

WHEREAS, this instrument is an Environmental Covenant developed and executed pursuant to the Act and the regulations promulgated thereunder;

WHEREAS, groundwater underlying the Property has been found to contain hazardous substances, including, but not limited to, carbon tetrachloride, tetrachloroethene, and trichloroethene;

WHEREAS, the selected "remedial action" for the Property, which has now been implemented, provided in part, for the following actions:

> Risk assessment with quarterly groundwater monitoring for twelve (12) quarters ending on September 2007.

WHEREAS, pursuant to the Brownfield Redevelopment and Voluntary Cleanup Plan (VCP), approved by ADEM by letter dated August 12, 2004, the assignees and agents of Acordis agreed to perform operation and maintenance activities at the Property, pursuant to an ADEM-approved Voluntary Cleanup Plan to address the effects of the release/disposal, which includes controlling exposure to the hazardous wastes, hazardous constituents, hazardous substances, pollutants, or contaminants;

WHEREAS, the VCP requires institutional controls to be implemented to address the effects of the release/disposal and to protect the remedy so that exposure to the hazardous waste, hazardous constituents, hazardous substances, pollutants, or contaminants is controlled by restricting the use of the Property and the activities on the Property;

WHEREAS, hazardous wastes, hazardous constituents, hazardous substances, pollutants, or contaminants remain on the Property;

WHEREAS, the purpose of this Covenant is to ensure protection of human health and the environment by placing restrictions on the Property to reduce the risk to human health to below the target risk levels for those hazardous wastes, hazardous constituents, hazardous substances, pollutants, or contaminants that remain on the Property;

WHEREAS, the exposure pathway of concern is ingestion of groundwater;

WHEREAS, further information concerning the release/disposal and the activities to correct the effects of the release/disposal may be obtained by contacting Chief, Land Division, Alabama Department of Environmental Management ("ADEM"), or his or her designated representative, at 1400 Coliseum Boulevard, Montgomery, Alabama, 36110;

WHEREAS, the Administrative Record concerning the environmental response project reflected in this Covenant is located at:

Satsuma Public Library
5466 Old Highway 43
Satsuma, Alabama 36572

and

Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, Alabama 36110

NOW, THEREFORE, Grantor hereby grants this Covenant and declares that the Property shall hereinafter be bound by, held, sold, used, improved, occupied, leased, hypothecated, encumbered, and/or conveyed subject to the following requirements:

1. <u>USE RESTRICTIONS</u>

The following activities shall not take place on the Property without first obtaining written approval from ADEM and Grantor through modification of this Covenant:

(a) The Property is restricted to industrial use only. The term "industrial use" shall include, but not be limited to, manufacturing, processing operations, office and warehouse use, storage and sales of durable goods, parking, and driveway use.

(b) No action shall be undertaken on the Property which will cause the groundwater underlying the Property to be extracted, consumed or utilized in any way, except for the limited purpose of monitoring groundwater contamination levels in accordance with plans approved by ADEM, if such shall be required in the future pursuant to applicable law.

2. **GENERAL PROVISIONS**

A. **Restrictions to Run with the Land.** This Covenant runs with the land pursuant to Ala. Code §35-19-5 (2007 Cum Supp.) and is perpetual, unless modified or terminated pursuant to Ala. Code §35-19-9 (Cum Supp. 2007); is imposed upon the entire Property unless expressly stated as applicable only to a specific portion thereof; inures to the benefit of and passes with each and every portion of the Property; and binds the Grantor, all persons using the land, all persons, their heirs, successors and assigns having any right, title or interest in the Property, or any part thereof who have subordinated those interests to this Environmental Covenant, if any, and all persons, their heirs, successors and assigns who obtain any right, title or interest in the Property, or any part thereof after the recordation of this Environmental Covenant.

B. **Notices Required**. In accordance with Ala. Code §35-19-4(b) (2007 Cum Supp.), the Grantor shall send written notification, pursuant to Section J, below, following transfer of a specified interest in, or concerning proposed changes in use of, applications for building permits for, or proposals for any site work affecting the contamination on, the Property. Said notification shall be sent within fifteen (15) days of each event listed in this Section.

C. **Registry/Recordation of Environmental Covenant; Amendment; or Termination**. Pursuant to Ala. Code §35-19-12(b) (2007 Cum Supp.), this Environmental Covenant and any amendment or termination thereof, shall be contained in ADEM's registry for environmental covenants. After an environmental covenant, amendment, or termination is filed in the registry, a notice of the covenant, amendment, or termination may be recorded in the land records in lieu of recording the entire covenant in compliance with §35-19-12(b). Grantor shall be responsible for filing the Environmental Covenant within thirty (30) days of the final required signature upon this Environmental Covenant.

D. **Compliance Certification**. In accordance with Ala. Code §35-19-4(b) (2007 Cum Supp.), the Owner shall submit an annual report to the Director of the EPA Region 4 Superfund Division, and to the Chief of the ADEM Land Division, on the anniversary of the date this Covenant was signed by the Grantor. Said report shall detail the Owner's compliance, and any lack of compliance with the terms of the Covenant.

E. **Right of Access**. The Owner hereby grants ADEM; ADEM's agents, contractors and employees; the Owner's agents, contractors and employees; and any Holders the right of access to the Site for implementation or enforcement of this Environmental Covenant.

F. **ADEM Reservations**. Notwithstanding any other provision of this Environmental Covenant, but subject to the terms and conditions of all Letters of Concurrence issued by ADEM in connection herewith, ADEM retains all of its access authorities and rights, as well as all of its rights to require additional land/water use restrictions, including enforcement authorities related thereto.

G. **Representations and Warranties**. Grantor hereby represents and warrants to the other signatories hereto:

i) That the Grantor has the power and authority to enter into this Environmental Covenant, to grant the rights and interests herein provided and to carry out all obligations hereunder;

ii) That the Grantor is the sole owner of the Property and holds fee simple title which is free, clear and unencumbered;

iii) That this Environmental Covenant will not materially violate, contravene, or constitute a material default under, any other agreement, document, or instrument to which Grantor is a party, by which Grantor may be bound or affected;

iv) That this Environmental Covenant will not materially violate or contravene any zoning law or other law regulating use of the Property; and

v) That this Environmental Covenant does not authorize a use of the Property which is otherwise prohibited by a recorded instrument that has priority over the Environmental Covenant.

H. **Compliance Enforcement**. In accordance with Ala. Code §35-19-11(b) (2007 Cum Supp.), the terms of the Environmental Covenant may be enforced by the parties to this Environmental Covenant; any person to whom this Covenant expressly grants power to enforce; any person whose interest in the real property or whose collateral or liability may be affected by the alleged violation of the Covenant; or a municipality or other unit of local government in which the real property subject to the Covenant is located, in accordance with applicable law. Failure to timely enforce compliance with this Environmental Covenant or the use or activity limitations contained herein by any person shall not bar subsequent enforcement by such person and shall not be deemed a waiver of the person's right to take action to enforce any non-compliance. Nothing in this Environmental Covenant shall restrict ADEM, or the Grantor, from exercising any authority under applicable law.

I. **Modifications/Termination**. Any modifications or terminations to this Environmental Covenant must be made in accordance with Ala. Code §§35-19-9 and 35-19-10 (2007 Cum Supp.).

J. **Notices.** Any document or communication required to be sent pursuant to the terms of this Covenant shall be sent to the following persons:

ADEM

Chief, Land Division
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, AL 36110

Grantor

Merceria Ludgood
President
Mobile County Commission
209 Government Street
Mobile, Alabama 36602

K. **No Property Interest Created in ADEM or the Public.** This Covenant does not in any way create any interest by ADEM or the general public in the Property that is subject to the Covenant. Furthermore, the act of approving this Environmental Covenant does not in any way create any interest by ADEM in the Property in accordance with Ala. Code §35-19-3(b) (2007 Cum. Supp.).

L. **Severability**. If any provision of this Environmental Covenant is found to be unenforceable in any respect, the validity, legality, and enforceability of the remaining provisions shall not in any way be affected or impaired.

M. **Governing Law**. This Environmental Covenant shall be governed by and interpreted in accordance with the laws of the State of Alabama.

N. **Recordation**. In accordance with Ala. Code §35-19-8(a) (2007 Cum. Supp.), Grantor shall record this Environmental Covenant and any amendment or termination of the Environmental Covenant in every county in which any portion of the real property subject to this Environmental Covenant is located. Grantor agrees to record this Environmental Covenant within fifteen (15) days after the date of the final required signature upon this Environmental Covenant.

O. **Effective Date.** The effective date of this Covenant shall be the date upon which the fully executed Covenant has been recorded, in accordance with Ala. Code §35-19-8(a) (2007 Cum. Supp).

P. **Distribution of Environmental Covenant**. Within fifteen (15) days of filing this Environmental Covenant, the Grantor shall distribute a recorded and date stamped copy of the recorded Environmental Covenant in accordance with Ala. Code §35-19-7(a) (2007 Cum Supp.). However, the validity of this Environmental Covenant will not be affected by the failure to provide a copy of the Covenant as provided herein.

Q. **ADEM References.** All references to ADEM shall include successor agencies, departments, divisions, or other successor entities.

R. **Grantor References.** All references to the Grantor shall include Grantor's successors and assigns, or other successor entities.

Grantor has caused this Environmental Covenant to be executed pursuant to The Alabama Uniform Environmental Covenants Act, on this 18th day of April, 2011.

IN TESTIMONY WHEREOF, the parties have hereunto set their hands this the day and year first above written.

This instrument prepared by:

Mobile County Commission
209 Government Street
Mobile, Alabama 36602

GRANTOR:

Mobile County, Alabama, a Political
Subdivision of the State of Alabama

By: Merceria Ludgood
Name: Merceria Ludgood
As: President, Mobile County Commission

STATE OF ALABAMA §

COUNTY OF MOBILE §

I, the undersigned Notary Public, in and for said County in said State, hereby certify that Merceria Ludgood, whose name as President of the Mobile County Commission, a ______________________________, is signed to the foregoing instrument and who is known to me, acknowledged before me on this day that, being informed of the contents of the instrument, he/she, as such President and with full authority, executed the same voluntarily for and as the act of said Mobile County, Alabama.

Given under my hand and official notarial seal this the 18th day of April, 2011.

Ima R. Eubanks
Notary Public
My Commission Expires: 03/11/15

(AFFIX NOTARIAL SEAL)

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

This Environmental Covenant is hereby approved by the State of Alabama this 10th day of June, 2011.

By: ______________________
Chief, Land Division
Alabama Department of Environmental Management

STATE OF ALABAMA §

COUNTY OF MOBILE §

I, the undersigned Notary Public, in and for said County in said State, hereby certify that Wm Gerald Hardy whose name as Chief, Land Division of the Alabama Department of Environmental Management, an agency of the State of Alabama, is signed to the foregoing instrument and who is known to me, acknowledged before me on this day that, being informed of the contents of the instrument, he/she, as such Chief, Land Division and with full authority, executed the same voluntarily for and as the act of said state agency.

Given under my hand and official notarial seal this the 10 day of June, 2011 2011.

Traci Robinson
Notary Public
My Commission Expires: 1-30-15

(AFFIX NOTARIAL SEAL)

EXHIBIT A
PROPERTY LEGAL DESCRIPTION

Parcel 1

Commence at a point recognized and accepted as the 3 mile post located on the St. Stephens Meridian, which is the line between Township 1 South, Range 1 East and Township 1 South, Range 1 West, such point being 15981.54 feet South and 102.47 feet East of the Ellicott Stone and being the Southwest corner of Section 18, Township 1 South, Range 1 East, thence run North along such line 836.40 feet to a concrete monument marked T B 1, the point of beginning; thence run North 89 degrees 10 minutes East 1325 feet to a concrete monument marked T B 11, thence run North 62 degrees 40 minutes East 4458.55 feet to a concrete monument marked T B 2, thence run North 89 degrees 44 minutes East 1500 feet to a concrete monument marked T B 3, thence run North 00 degrees 16 minutes West 1456.80 feet to a concrete monument marked T B 4, thence run North 89 degrees 47 minutes East 2804.02 feet to a concrete monument marked T B 5, thence run North 44 degrees 47 minutes East 308.2 feet to a concrete monument marked T B 6, thence run North 44 degrees 47 minutes East 118 feet, more or less, to the mean low water mark of the West margin of the Mobile River, thence run Northwardly along the meanderings of such West margin of the Mobile River to the point where such West margin is intersected by a line extended North 89 degrees 47 minutes East 172.5 feet, more or less, from a monument marked T B 7, thence run South 89 degrees 47 minutes West 172.5 feet, more or less to such monument marked T B 7, thence continue to run South 89 degrees 47 minutes West 5625.77 feet to a concrete monument marked T B 8, thence run South 72 degrees 36 minutes West 5041.25 feet to a concrete monument marked T B 9, located on the East line of the right of way of U.S. Highway 43, thence run South 00 degrees 07 minutes West along the East line of such right of way 3029.03 feet to a concrete monument marked T B 10, thence run North 89 degrees 10 minutes East 1428.23 feet to point of beginning; such property being a part of Section 18 and a part of Private Claim Section 3, Township 1 South, Range 1 East and a part of Section 13, Township 1 South, Range 1 West; being that property heretofore conveyed to Courtaulds (Alabama) Inc. from Alabama Property Company by Deed dated December 31, 1951, and recorded in Deed Book 543, Page 154;

LESS and EXCEPT the following:

Commencing at the Southwest corner of Section 18, Township 1 South, Range 1 East, Mobile County, Alabama; run thence Northwardly along the West line of said Section 18, 836.4 feet to the South line of the Courtaulds property; thence run North 89 degrees 10 minutes East along the South line of said Courtaulds property, 539.01 feet; thence run North 00 degrees 45 minutes 14 seconds West, 2200.25 feet to the point of beginning of the property herein described; thence continue North 00 degrees 45 minutes 14 seconds West, 546.93 feet; thence run South 89 degrees 07 minutes 31 seconds West, 124.1 feet; thence run North 00 degrees 55 minutes 12 seconds West 217.33 feet; thence run North 89 degrees 07 minutes 20 seconds East, 613.24 feet; thence run South 00 degrees 51 minutes 52 seconds East 691.97 feet; thence run South 89 degrees 04 minutes 04 seconds West, 111.87 feet; thence run South 00 degrees 55 minutes 56 seconds East, 73.00 feet; thence run South 89 degrees 14 minutes 46 seconds West, 378.21 feet to the point of beginning; being that property heretofore conveyed to Gulf Fibers, Inc. by Cortex Finance, Incorporated and Courtaulds North America, Inc. by instruments dated May 31, 1988, and recorded in Real Property Book 3273, Page 894 and Real Property Book 3275, Page 693;

LESS and EXCEPT the following:

Commencing at the Southeast Corner of Section 13, Township 1 South, Range 1 West, Mobile County, Alabama; run North 00 degrees 07 minutes 04 seconds West, along the East line of said Section 13, 836.40 feet to a concrete monument marked T B 1; thence run South 89 degrees 10 minutes west, 270.00 feet to a point on the West right of way of the Southern Railway System, (Norfolk Southern Corp.); thence run North 00 degrees 50 minutes West, along said railroad right of way, 645.00 feet to the point of beginning of the property herein described; thence run South 89 degrees 10 minutes West, 67.01 feet; thence run Southwestwardly, along a curve to the left, said curve having a radius of 680.00 feet, an arc distance of 484.40 feet, (the chord bears South 68 degrees 45 minutes 33 seconds West and measures 474.22 feet); thence run South 48 degrees 21 minutes 06 seconds West, 204.61 feet; thence run Southwestwardly, along a curve to the right, said curve having a radius of 600.00 feet, an arc distance 415.17 feet, (the chord bears South 68 degrees 10 minutes 27 seconds West and measures 406.93 feet), to a point on the Eastern right of way of U.S. Highway No. 43; thence run North 31 degrees 54 minutes 32 seconds West, along said right of way, 160.78 feet to a concrete right of way monument; thence run North 00 degrees 07 minutes 23 seconds East, along said Highway right of way 2693.28 feet; thence run North 72 degrees 24 minutes 30 seconds East, 1132.37 feet to a point on the West right of way of the aforementioned Southern Railway System; thence run South 00 degrees 50 minutes East, along said railroad right of way, 2712.24 feet to the point of beginning.

LESS and EXCEPT the following:

Commencing at the Southwest corner of Section 18, Township 1 South, Range 1 East, Mobile County, Alabama; thence proceed along the West line of said section North 00 degrees 21 minutes 39 seconds East for a distance of 836.40 feet to a point; thence proceed in an Easterly direction along a bearing of North 89 degrees 31 minutes 39 seconds East for a distance of 1330.12 feet to a point; thence proceed North 63 degrees 01 minutes 39 seconds East for a distance of 1509.31 feet to a point on the West line of an Alabama Power Company easement; thence proceed in a Northerly direction along said easement along a bearing of North 00 degrees 28 minutes 21 seconds West for a distance of 1329.09 feet to a set 5/8" rebar being the Point of Beginning for the parcel described herein; thence proceeding in a counter-clockwise direction around said parcel continue along the West line of the Alabama Power Company easement along a bearing of North 00 degrees 28 minutes 21 seconds West for a distance of 277.99 feet to a point; thence run South 71 degrees 16 minutes 41 seconds West 1002.72 feet to a point; thence run South 00 degrees 00 minutes 00 seconds East 180.70 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East for 231.44 feet to a point; thence run South 00 degrees 20 minutes 45 seconds East for 270.79 feet to a point; thence run North 89 degrees 17 minutes 43 seconds East for 222.46 feet to a point; thence run North 00 degrees 00 minutes 00 seconds East for 187.43 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East for a distance of 84.00 feet to a point; thence run South 00 degrees 00 minutes 00 seconds West for a distance of 100.45 feet to a point; thence run South 43 degrees 32 minutes 08 seconds East for a distance of 54.45 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East 146.50 feet to a point; thence proceed North 00 degrees 00 minutes 00 seconds East 445.12 feet to a point; thence run South 90 degrees 00 minutes 00 seconds East for a distance of 228.43 feet to the Point of Beginning. Said property lying entirely and being situated in Section 18, Township 1 South, Range 1 East, Mobile County, Alabama.

LESS and EXCEPT the following:

COMMENCING AT THE SOUTHWEST CORNER OF SECTION 18, TOWNSHIP 1 SOUTH, RANGE 1 EAST, MOBILE COUNTY, ALABAMA; THENCE RUN ALONG THE WEST LINE OF SAID SECTION N00°21'39"E 836.40' TO A POINT; THENCE LEAVING SAID SECTION LINE RUN N89°31'39"E 1330.12 FEET; THENCE RUN N63°01'39"E 1509.31 FEET TO A POINT ON THE WEST LINE OF AN ALABAMA POWER EASEMENT; THENCE RUN ALONG SAID WEST LINE N00°28'21"E 706.61 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156) BEING THE POINT OF BEGINNING OF THE PROPERTY HEREIN DESCRIBED;THENCE LEAVING SAID EASEMENT LINE RUN N90°00'00"W 957.08 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN N00°00'00"E 397.88 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN S90°00'00E 231.44 FEET TO A SET NAIL & DISK; THENCE RUN 800°20'45"E 270.79 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN N89°17'43"E 222.46 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN N00°00'00"E 187.43 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN S90°00'00"E 84.00 FEET TO A SET NAIL & DISK; THENCE RUN S00°00'00"W 100.45 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN S43°32'08"E 54.45 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN S90°00'00"E 146.50 FEET TO A SET NAIL & DISK; THENCE RUN N00°00'00"E 445.12 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156); THENCE RUN S90°00'00"E 228.43 FEET TO A SET 5/8" REBAR (GMC CAP NO. CA00156) LYING ON THE AFOREMENTIONED WEST LINE OF AN ALABAMA POWER EASEMENT; THENCE RUN S00°28'21"E 622.48 FEET TO THE POINT OF BEGINNING.

33.50
2.00
35.50

2011034113 Book-6789 Page-290
Total Number of Pages: 13

ENVIRONMENTAL COVENANT
(Sludge Lagoons, Non-Hazardous Landfill and Septic Tank Area)

The County of Mobile (hereinafter "Grantor" or "Owner") grants an Environmental Covenant (hereinafter "Covenant" or "Environmental Covenant") this 18th day of April, 2011, pursuant to The Alabama Uniform Environmental Covenants Act, Ala. Code §§ 35-19-1 to 35-19-14 (2007 Cum. Supp.) (hereinafter "the Act" or "Act"), and the regulations promulgated thereunder:

WHEREAS, the Grantor is the owner of certain real property identified as the former Acordis Cellulosic Fibers, Inc. ("Acordis") facility situated at 12740 U.S. Highway 43 North, in Mobile County, Alabama (hereinafter "the Property"), which Property was conveyed to Grantor by deed dated September 30, 2003, and recorded in the Office of the Judge of Probate for Mobile County, Alabama, in Deed Book 5467 at Page 0330;

WHEREAS, this instrument is an Environmental Covenant developed and executed pursuant to the Act and the regulations promulgated thereunder;

WHEREAS, disposal of non-hazardous substances, including, but not limited to, wastewater treatment sludges in the sludge lagoons described on Exhibit A and nonhazardous facility wastes (solidified waste viscose, spent viscose filters, scrap metal, bricks, rags, liner materials, wire, concrete, and waste rayon tow) in the former nonhazardous waste landfill described on Exhibit B, occurred on such sites and a septic tank system located upon 0.053 acres as described upon Exhibit C has been left in place (the real property described on Exhibits A, B and C being collectively referred to hereafter as the "Sites") before the Property was owned by Grantor;

WHEREAS, the selected "remedial action" for the Sites, which has now been implemented, provided in part, for the following actions:

1. Capping of the sludge lagoons with a multi-layer cap consisting of high strength geotextile, shredded mulch, sand, clay, and topsoil;
2. Capping the former non-hazardous waste landfill with clay; and
3. Investigation of the former septic tank area.

WHEREAS, pursuant to the Brownfield Redevelopment and Voluntary Cleanup Plan (VCP), the assignees and agents of Acordis agreed to perform operation and maintenance activities at the Property, pursuant to an ADEM-approved Voluntary Cleanup Plan, as approved by ADEM by letter dated August 12, 2004, to address the effects of the release/disposal, which includes controlling exposure to the hazardous wastes, hazardous constituents, hazardous substances, pollutants, or contaminants;

WHEREAS, the VCP requires institutional controls to be implemented to address the effects of the release/disposal and to protect the remedy so that exposure to the hazardous waste, hazardous constituents, hazardous substances, pollutants, or contaminants is controlled by restricting the use of the Sites and the activities on the Sites;

WHEREAS, hazardous wastes, hazardous constituents, hazardous substances, pollutants, or contaminants remain on the Site;

WHEREAS, the purpose of this Covenant is to ensure protection of human health and the environment by placing restrictions on the Sites to reduce the risk to human health to below the target risk levels for those hazardous wastes, hazardous constituents, hazardous substances, pollutants, or contaminants that remain on the Site;

WHEREAS, further information concerning the release/disposal and the activities to correct the effects of the release/disposal may be obtained by contacting Chief, Land Division, Alabama Department of Environmental Management ("ADEM"), or his or her designated representative, at 1400 Coliseum Boulevard, Montgomery, Alabama, 36110;

WHEREAS, the Administrative Record concerning the environmental response project reflected in this Covenant is located at:

Satsuma Public Library
5466 Old Highway 43
Satsuma, Alabama 36572

and

Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, Alabama 36110

NOW, THEREFORE, Grantor hereby grants this Covenant to the Holder, and declares that the Sites shall hereinafter be bound by, held, sold, used, improved, occupied, leased, hypothecated, encumbered, and/or conveyed subject to the following requirements:

1. USE RESTRICTIONS

The following activities shall not take place on the identified Sites without first obtaining written approval from ADEM and Grantor through modification of this Covenant:

No person shall fill, grade, excavate, dig, drill, mine or otherwise materially disturb or improve the land upon which the Sites are located except as necessary to maintain the caps and other remedy features placed upon the Sites in accordance with the VCP.

2. GENERAL PROVISIONS

A. **Restrictions to Run with the Land**. This Covenant runs with the land pursuant to Ala. Code §35-19-5 (2007 Cum Supp.) and is perpetual, unless modified or terminated pursuant to Ala. Code §35-19-9 (Cum Supp. 2007); is imposed upon the portions of the Property described as the "Sites" above and is therefor only applicable to such specific portions of the Property thereof as constitute the Sites; inures to the benefit of and passes with each and every portion of the Property; and binds the Grantor, all persons using the land, all persons, their heirs, successors and assigns having any right, title or interest in the Property, or any part thereof who have subordinated those interests to this Environmental Covenant, if any, and all persons, their heirs, successors and assigns who obtain any right, title or interest in the Property, or any part thereof after the recordation of this Environmental Covenant.

B. **Notices Required**. In accordance with Ala. Code §35-19-4(b) (2007 Cum Supp.), the Grantor shall send written notification, pursuant to Section J, below, following transfer of a specified interest in, or concerning proposed changes in use of, applications for building permits for, or proposals for any site work affecting the contamination on, the Sites. Said notification shall be sent within fifteen (15) days of each event listed in this Section.

C. **Registry/Recordation of Environmental Covenant; Amendment; or Termination**. Pursuant to Ala. Code §35-19-12(b) (2007 Cum Supp.), this Environmental Covenant and any amendment or termination thereof, shall be contained in ADEM's registry for environmental covenants. After an environmental covenant, amendment, or termination is filed in the registry, a notice of the covenant, amendment, or termination may be recorded in the land records in lieu of recording the entire covenant in compliance with §35- 19-12(b). Grantor shall be responsible for filing the Environmental Covenant within thirty (30) days of the final required signature upon this Environmental Covenant.

D. **Compliance Certification**. In accordance with Ala. Code §35-19-4(b) (2007 Cum Supp.), the Owner shall submit an annual report to the Director of the EPA Region 4 Superfund Division, and to the Chief of the ADEM Land Division, on the anniversary of the date this Covenant was signed by the Grantor. Said report shall detail the Owner's compliance, and any lack of compliance with the terms of the Covenant.

E. **Right of Access**. The Owner hereby grants ADEM; ADEM's agents, contractors and employees; the Owner's agents, contractors and employees; and any Holders the right of access to the Sites for implementation or enforcement of this Environmental Covenant.

F. **ADEM Reservations**. Notwithstanding any other provision of this Environmental Covenant, but subject to the terms and conditions of all Letters of Concurrence issued by ADEM in connection therewith, ADEM retains all of its access authorities and rights, as well as all of its rights to require additional land/water use restrictions, including enforcement authorities related thereto.

G. **Representations and Warranties**. Grantor hereby represents and warrants to the other signatories hereto:

i) That the Grantor has the power and authority to enter into this Environmental Covenant, to grant the rights and interests herein provided and to carry out all obligations hereunder;

ii) That the Grantor is the sole owner of the Property and holds fee simple title which is free, clear and unencumbered;

iii) That this Environmental Covenant will not materially violate, contravene, or constitute a material default under, any other agreement, document, or instrument to which Grantor is a party, by which Grantor may be bound or affected;

iv) That this Environmental Covenant will not materially violate or contravene any zoning law or other law regulating use of the Property; and

v) That this Environmental Covenant does not authorize a use of the Property which is otherwise prohibited by a recorded instrument that has priority over the Environmental Covenant.

H. **Compliance Enforcement**. In accordance with Ala. Code §35-19-11(b) (2007 Cum Supp.), the terms of the Environmental Covenant may be enforced by the parties to this Environmental Covenant; any person to whom this Covenant expressly grants power to enforce; any person whose interest in the real property or whose collateral or liability may be affected by the alleged violation of the Covenant; or a municipality or other unit of local government in which the real property subject to the Covenant is located, in accordance with applicable law. Failure to timely enforce compliance with this Environmental Covenant or the use or activity limitations contained herein by any person shall not bar subsequent enforcement by such person and shall not be deemed a waiver of the person's right to take action to enforce any non-compliance. Nothing in this Environmental Covenant shall restrict ADEM, or the Grantor, from exercising any authority under applicable law.

I. **Modifications/Termination**. Any modifications or terminations to this Environmental Covenant must be made in accordance with Ala. Code §§35- 19-9 and 35-19-10 (2007 Cum Supp.).

J. **Notices.** Any document or communication required to be sent pursuant to the terms of this Covenant shall be sent to the following persons:

ADEM

Chief, Land Division
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, AL 36110

Grantor

Merceria Ludgood
President
Mobile County Commission
209 Government Street
Mobile, Alabama 36602

K. **No Property Interest Created in ADEM or the Public.** This Covenant does not in any way create any interest by ADEM or the general public in the Sites that are subject to the Covenant. Furthermore, the act of approving this Environmental Covenant does not in any way create any interest by ADEM in the Property in accordance with Ala. Code §35-19-3(b) (2007 Cum. Supp.).

L. **Severability**. If any provision of this Environmental Covenant is found to be unenforceable in any respect, the validity, legality, and enforceability of the remaining provisions shall not in any way be affected or impaired.

M. **Governing Law**. This Environmental Covenant shall be governed by and interpreted in accordance with the laws of the State of Alabama.

N. **Recordation**. In accordance with Ala. Code §35-19-8(a) (2007 Cum. Supp.), Grantor shall record this Environmental Covenant and any amendment or termination of the Environmental Covenant in every county in which any portion of the real property subject to this Environmental Covenant is located. Grantor agrees to record this Environmental

Covenant within fifteen (15) days after the date of the final required signature upon this Environmental Covenant.

O. **Effective Date.** The effective date of this Covenant shall be the date upon which the fully executed Covenant has been recorded, in accordance with Ala. Code §35-19-8(a) (2007 Cum. Supp).

P. **Distribution of Environmental Covenant**. Within fifteen (15) days of filing this Environmental Covenant, the Grantor shall distribute a recorded and date stamped copy of the recorded Environmental Covenant in accordance with Ala. Code §35-19-7(a) (2007 Cum Supp.). However, the validity of this Environmental Covenant will not be affected by the failure to provide a copy of the Covenant as provided herein.

Q. **ADEM References.** All references to ADEM shall include successor agencies, departments, divisions, or other successor entities.

R. **Grantor References.** All references to the Grantor shall include Grantor's successors and assigns, or other successor entities.

Grantor has caused this Environmental Covenant to be executed pursuant to The Alabama Uniform Environmental Covenants Act, on this 18th day of April, 2011.

IN TESTIMONY WHEREOF, the parties have hereunto set their hands this the day and year first above written.

This instrument prepared by:

Mobile County Commission
209 Government Street
Mobile, Alabama 36602

GRANTOR:

Mobile County, Alabama, a Political
Subdivision of the State of Alabama

By: Merceria Ludgood
Name: Merceria Ludgood
As: President, Mobile County Commission

State of Alabama-Mobile County
I certify this instrument was filed on:
June 23, 2011 @ 2:35:14 PM

S.R. FEE	$2.00
RECORDING FEES	$33.50
TOTAL AMOUNT	$35.50

2011034113
Don Davis, Judge of Probate

STATE OF ALABAMA §

COUNTY OF MOBILE §

I, the undersigned Notary Public, in and for said County in said State, hereby certify that Merceria Ludgood, whose name as President of the Mobile County Commission, a ____________________________, is signed to the foregoing instrument and who is known to me, acknowledged before me on this day that, being informed of the contents of the instrument, he/she, as such President and with full authority, executed the same voluntarily for and as the act of said Mobile County, Alabama.

Given under my hand and official notarial seal this the 18th day of April, 2011.

Ama R. Eubanks
Notary Public
My Commission Expires: 03/11/15

(AFFIX NOTARIAL SEAL)

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

This Environmental Covenant is hereby approved by the State of Alabama this 10th day of June, 2011.

By: ______________________________
Chief, Land Division
Alabama Department of Environmental Management

STATE OF ALABAMA §

COUNTY OF MOBILE §

I, the undersigned Notary Public, in and for said County in said State, hereby certify that Wm Gerald Hardy, whose name as Chief, Land Division of the Alabama Department of Environmental Management, an agency of the State of Alabama, is signed to the foregoing instrument and who is known to me, acknowledged before me on this day that, being informed of the contents of the instrument, he/she, as such Chief, Land Division and with full authority, executed the same voluntarily for and as the act of said state agency.

Given under my hand and official notarial seal this the 10 day of June, 2011
2011.

Traci Robinson
Notary Public
My Commission Expires: 1-30-15

(AFFIX NOTARIAL SEAL)

Exhibit A
Sludge Lagoons – Legal Description

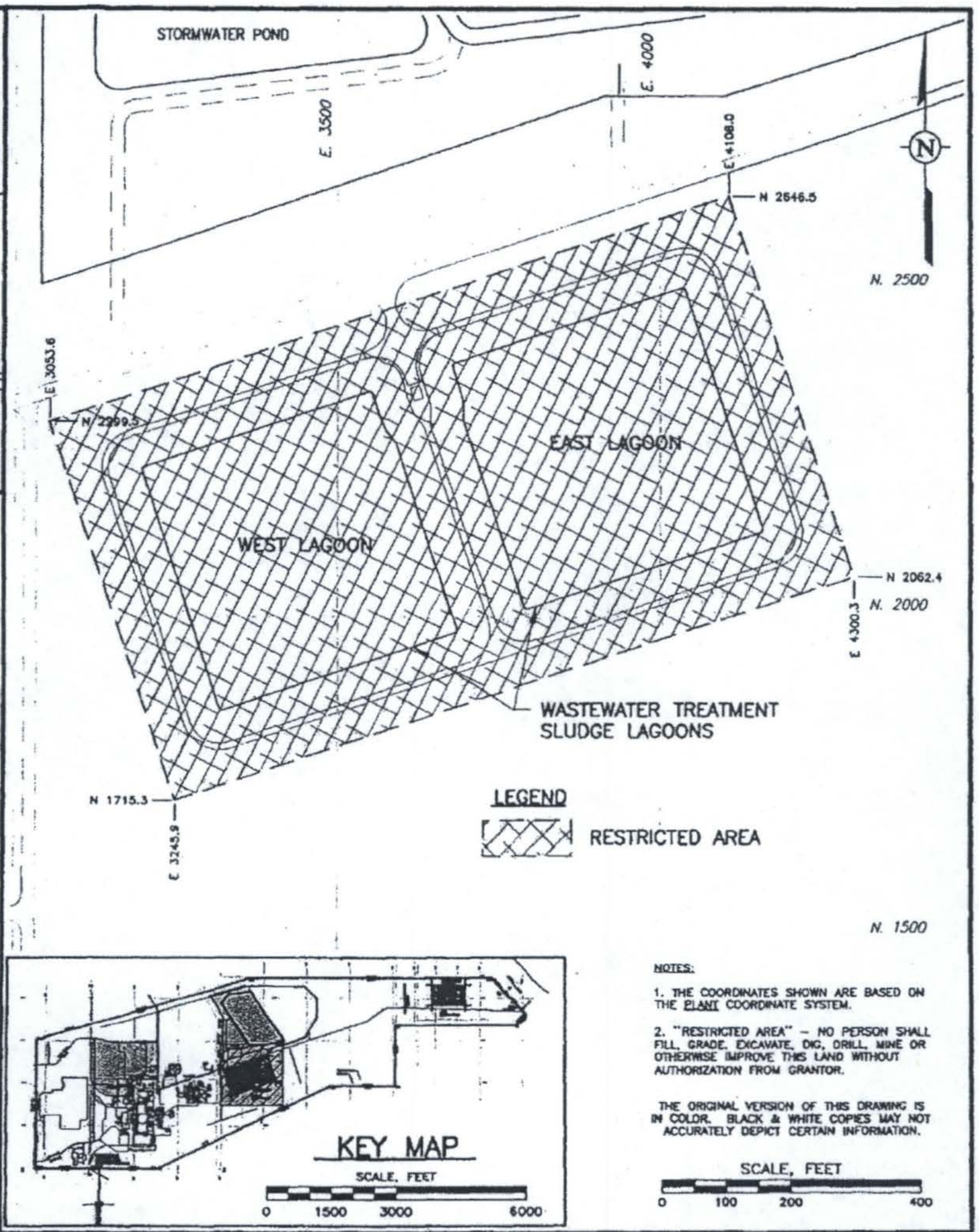
October 18, 2010

STATE OF ALABAMA:

COUNTY OF MOBILE:

COMMENCING AT THE SOUTHWEST CORNER OF SECTION 18, TOWNSHIP 1 SOUTH, RANGE 1 EAST, MOBILE COUNTY, ALABAMA; THENCE RUN NORTH, 3176.87 FEET; THENCE RUN EAST, 2799.86 FEET TO THE POINT OF BEGINNING OF THE PROPERTY HEREIN DESCRIBED (HAVING ORIGINAL PLANT COORDINATES OF NORTH 2299.5 AND EAST 3053.6); THENCE RUN NORTH 70°57'02" EAST, 1110.03 FEET TO A POINT (HAVING ORIGINAL PLANT COORDINATES OF NORTH 2646.5 AND EAST 4108.0); THENCE RUN SOUTH 19°03'22" EAST, 614.94 FEET TO A POINT (HAVING ORIGINAL PLANT COORDINATES OF NORTH 2062.4 AND EAST 4300.3); THENCE RUN SOUTH 70°56'44" WEST, 1110.06 FEET TO A POINT (HAVING ORIGINAL PLANT COORDINATES OF NORTH 1715.3 AND EAST 3245.9); THENCE RUN NORTH 19°03'12" WEST, 615.04 FEET TO THE POINT OF BEGINNING AND CONTAINING 15.67 ACRES, MORE OR LESS.

Drawn By: Arkz 062410 Checked: Approved: DWG Name: 218287–A07a



LEGEND

▨ RESTRICTED AREA

NOTES:

1. THE COORDINATES SHOWN ARE BASED ON THE PLANT COORDINATE SYSTEM.

2. "RESTRICTED AREA" – NO PERSON SHALL FILL, GRADE, EXCAVATE, DIG, DRILL, MINE OR OTHERWISE IMPROVE THIS LAND WITHOUT AUTHORIZATION FROM GRANTOR.

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE COPIES MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

SCALE, FEET

0 100 200 400

WSP

WSP Environment & Energy
750 Holiday Drive, Suite 410
Pittsburgh, Pennsylvania 15220
(412) 604-1040

EXHIBIT A

SLUDGE LAGOONS
LAND USE RESTRICTION

ACORDIS CELLULOSIC FIBERS INC.
AXIS, ALABAMA

PREPARED FOR
QLT OF ALABAMA LLC
NEW YORK, NEW YORK

R:\AutoCAD DWGs\200\218287 ACORDIS AL\218287A07.dwg, 10/12/2010 1:50:18 PM, USRZ01165

Exhibit B

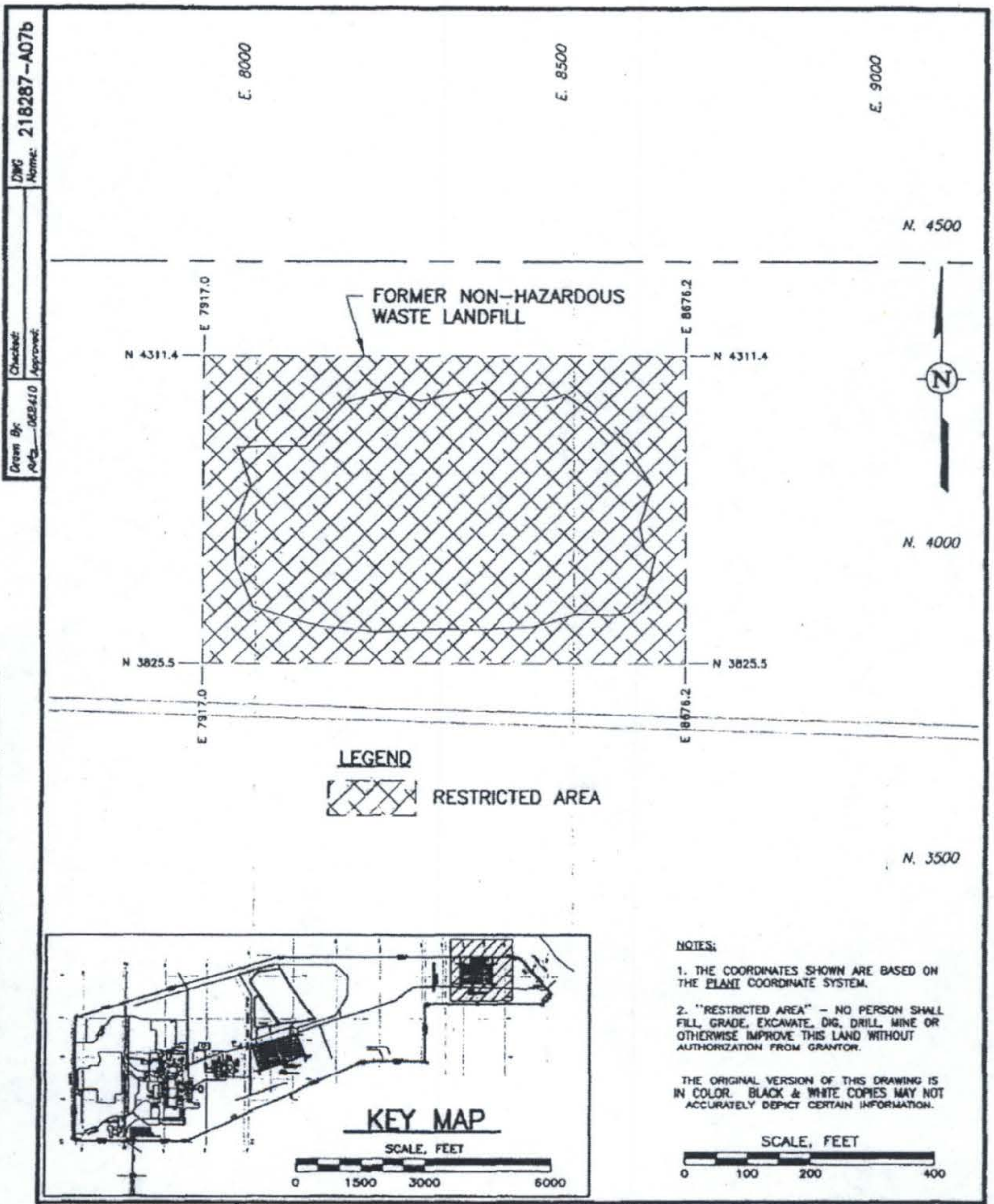
Former Non-Hazardous Waste Landfill – Legal Description

October 18, 2010

STATE OF ALABAMA:

COUNTY OF MOBILE:

COMMENCING AT THE SOUTHWEST CORNER OF SECTION 18, TOWNSHIP 1 SOUTH, RANGE 1 EAST, MOBILE COUNTY, ALABAMA; THENCE RUN NORTH, 5259.29 FEET; THENCE RUN EAST, 7633.48 FEET TO THE POINT OF BEGINNING OF THE PROPERTY HEREIN DESCRIBED (HAVING ORIGINAL PLANT COORDINATES OF NORTH 4311.4 AND EAST 7917.0); THENCE RUN NORTH 89°10'00" EAST, 759.20 FEET TO A POINT (HAVING ORIGINAL PLANT COORDINATES OF NORTH 4311.4 AND EAST 8676.2); THENCE RUN SOUTH 0°50'00" EAST, 485.90 FEET TO A POINT (HAVING ORIGINAL PLANT COORDINATES OF NORTH 3825.5 AND EAST 8676.2); THENCE RUN SOUTH 89°10'00" WEST, 759.20 FEET TO A POINT (HAVING ORIGINAL PLANT COORDINATES OF NORTH 3825.5 AND EAST 7917.0); THENCE RUN NORTH 0°50'00" WEST, 485.90 FEET TO THE POINT OF BEGINNING AND CONTAINING 8.47 ACRES, MORE OR LESS.



NOTES:

1. THE COORDINATES SHOWN ARE BASED ON THE PLANT COORDINATE SYSTEM.

2. "RESTRICTED AREA" – NO PERSON SHALL FILL, GRADE, EXCAVATE, DIG, DRILL, MINE OR OTHERWISE IMPROVE THIS LAND WITHOUT AUTHORIZATION FROM GRANTOR.

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WSP
WSP Environment & Energy
750 Holiday Drive, Suite 410
Pittsburgh, Pennsylvania 15220
(412) 604-1040

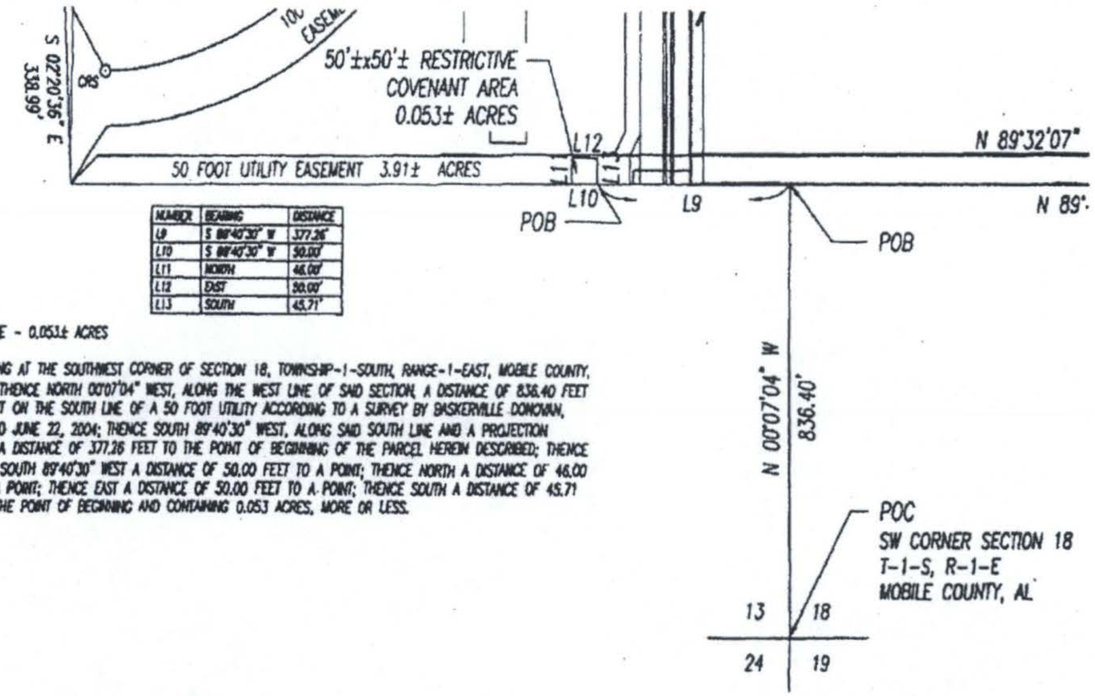
EXHIBIT B

FORMER NON-HAZARDOUS WASTE LANDFILL LAND USE RESTRICTION

ACORDIS CELLULOSIC FIBERS INC.
AXIS, ALABAMA
PREPARED FOR
QLT OF ALABAMA LLC
NEW YORK, NEW YORK

R:\AutoCAD DWGs\2002\218287 ACORDIS AL\218287A07.dwg, 10/12/2010 1:50:35 PM, USRZ01165

EXHIBIT C



NUMBER	BEARING	DISTANCE
L9	S 89°40'30" W	377.26'
L10	S 89°40'30" W	50.00'
L11	NORTH	46.00'
L12	EAST	50.00'
L13	SOUTH	45.71'

RESTRICTIVE - 0.053± ACRES

COMMENCING AT THE SOUTHWEST CORNER OF SECTION 18, TOWNSHIP-1-SOUTH, RANGE-1-EAST, MOBILE COUNTY, ALABAMA; THENCE NORTH 00°07'04" WEST, ALONG THE WEST LINE OF SAID SECTION, A DISTANCE OF 836.40 FEET TO A POINT ON THE SOUTH LINE OF A 50 FOOT UTILITY ACCORDING TO A SURVEY BY BASKERVILLE DONOVAN, INC., DATED JUNE 22, 2004; THENCE SOUTH 89°40'30" WEST, ALONG SAID SOUTH LINE AND A PROJECTION THEREOF, A DISTANCE OF 377.26 FEET TO THE POINT OF BEGINNING OF THE PARCEL HEREIN DESCRIBED; THENCE CONTINUE SOUTH 89°40'30" WEST A DISTANCE OF 50.00 FEET TO A POINT; THENCE NORTH A DISTANCE OF 46.00 FEET TO A POINT; THENCE EAST A DISTANCE OF 50.00 FEET TO A POINT; THENCE SOUTH A DISTANCE OF 45.71 FEET TO THE POINT OF BEGINNING AND CONTAINING 0.053 ACRES, MORE OR LESS.

REFERENCE 16

LANCE R. LEFLEUR
DIRECTOR

ADEM

ROBERT J. BENTLEY
GOVERNOR

Alabama Department of Environmental Management
adem.alabama.gov
1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ■ FAX (334) 271-7950

July 25, 2011

Mr. Bill Melton
Mobile County Commission
205 Government Street
Mobile, Alabama 36644

Mr. John Stewart
Acordis Cellulosic Fibers Inc.
Post Office Box 141
Axis, Alabama 36505

Re: Conditional Letter of Concurrence
Former Acordis Cellulosic Fibers site

Dear Messrs. Melton and Stewart:

On October 27, 2003, Environmental Strategies Corporation submitted an application on behalf of Mobile County and Acordis Cellulosic Fibers Inc. to the Department to address assessment and remediation of the referenced site under the Brownfield Redevelopment and Voluntary Cleanup Program. The 580 acre site is at 12740 U.S. Highway 43 North in Axis, Mobile County, Alabama.

The Department has determined that the applicants have successfully executed the approved voluntary cleanup plan and is issuing this Conditional Letter of Concurrence. The site is eligible for certain liability protection under the Land Recycling and Economic Redevelopment Act, for contamination discovered and addressed under the approved voluntary cleanup plan. Should information become available in the future indicating that a threat to human health or the environment exists from contamination at the site, additional measures may be necessary to maintain liability protection, including additional site assessment and/or remediation.

The limitations on the use of this site include a site wide restriction for industrial use only and a prohibition on the use of groundwater, and an area specific restriction on grading, excavating, digging, drilling, mining or otherwise materially disturbing capped areas except as necessary for maintenance. Limitations of liability for this site shall remain in effect if these use limitations are adequately maintained. Since some contamination remains at this site and use limitations are part of the remedial action approved by ADEM, two environmental covenants documenting the restrictions have been registered with ADEM and recorded in the land records of Mobile County, Alabama.

If you have questions or comments regarding this matter, please contact Crystal Collins at (334) 279-3076 or via email at ccollins@adem.state.al.us.

Sincerely,

Wm. Gerald Hardy, Chief
Land Division

WGH/cc

REFERENCE 17

LANCE R. LEFLEUR
DIRECTOR

ADEM

ROBERT J. BENTLEY
GOVERNOR

Alabama Department of Environmental Management
adem.alabama.gov
1400 Coliseum Blvd. 36110-2400 ▪ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ▪ FAX (334) 271-7950

April 3, 2012

MEMORANDUM

TO: Dave Davis, Chief
Assessment Section
Environmental Services Branch
Land Division

FROM: Alan Blake, Hydrogeologist
Hydrogeology Section
Groundwater Branch
Land Division

RE: CERCLA Reassessment, Hydrogeology Report for Courtaulds Fibers, Inc., Le Moyne, Mobile County, Alabama

A hydrogeology report has been prepared for the above site in north Mobile County, Alabama. The author has used data and reference material available to the Groundwater Branch. The author has not visited the site to field verify the material.

LOCATION

The Courtaulds Fibers, Inc. site is located in northern Mobile County, Alabama about .5 miles east of U.S. Highway 13 near the town of Le Moyne (Figure 1). The United States Geological Survey 7.5 minute Quadrangle Map titled Creola, Alabama shows the site to be located in Section 18, Township 1 South, Range 1 East (Figures 3 and 4). Specifically, the site is located at Latitude 30 degrees, 57 minutes, 40.00 seconds north and Longitude 88 degrees, 0 minutes, 50.00 seconds west.

CLIMATE

The climate of Mobile County is Humid Subtropical. Summers are hot and humid. Winters are warm. Rains occur throughout the year.

The average daily winter temperature is 53 degrees Fahrenheit and the average daily minimum temperature is 43 degrees. The summer average daily temperature is 81 degrees and the average daily maximum temperature is 91 degrees.

Average yearly precipitation is about 63.58 inches. The average relative humidity is about 60 percent during the day and higher during the night, averaging about 90 percent at dawn. Prevailing wind direction is from the north.

TOPOGRAPHY AND PHYIOGRAPHY

TOPOGRAPHY AND PHYIOGRAPHY

Mobile County is located in the East Gulf Coastal Plain Physiographic Section (Figure 2). Three Physiographic Regions are identified in the county. The majority of the surface lies within the Southern Pine Hills. Bordering the Pine Hills to the south and east is the Coastal Lowlands. Along the east corner of the county the Alluvial-Deltaic Plain of the Mobile-Tensas Delta is found.

The Southern Pine Hills are formed by the sediments of the Citronelle Formation of Pliocene-Pleistocene Age and the undifferentiated Miocene Age sediments below the Citronelle Formation. Elevations on the ridges and hill tops vary from about 340 feet National Geodetic Vertical Datum (NGVD) in the northern part of Mobile County near Citronelle to about 75 to 100 feet NGVD in the southern part of the county near Grand Bay (Figure 1).

The Coastal Lowlands are formed on Pleistocene Age sediments along Mississippi Sound, the western side of Mobile Bay and along the Mobile-Tensas Delta. The surface which represents terrace surfaces varies in elevation 0 to 25 feet NGVD along Mississippi Sound, 10 to 40 feet NGVD along the west side of Mobile Bay and 10 to 50 feet NGVD along the Mobile-Tensas Delta.

The site is located on the surface of the Coastal Lowlands on two Pleistocene Terrace surfaces (Figures 3 and 4). The highest surface varies in elevation from 30 to 50 feet NGVD, The lowest surface varies in elevation from 6 to 25 feet NGVD. The Delta is located to the east and the Southern Pine Hills are located to the west. The surface slopes to the east to the Mobile River and south towards Mobile.

SOILS

The Natural Resources Conservation Service (NRCS) has identified 3 soil types in the vicinity of the site, Izagora-Annemaine association, Izagora- Bethera association and Dorovan-Levy association soils. Izagora-Annemaine and Izagora-Bethera soils form the terrace surfaces from the Southern Pine Hills to the Mobile River. Dorovan-Levy soils form the Delta deposits along the westside of the Mobile River and in the Delta east of the Mobile River.

The terrace soils (Izagora-Annemaine and Izagora –Bethera) are moderately well drained. The soils vary from clays (CL, Ch) to silty sand (SM). PH varies from 4.5 to 5.5. The soils perk slowly and have permeabilities from .6 to 2 inches per hour.

Delta soils (Dorovan-Levy) are very poorly drained. The soils are generally clays (CL, CH), silts (ML, MH) or muck. Permeabilities are slow from .06 to .2 inches per hour. PH varies from 3.6 to 5.5.

GEOLOGY

Geologic units that out crop in Mobile County (Figure 6) are of sedimentary origin and include deposits in the Miocene, Pliocene, Pleistocene and Holocene Series, The units consist of materials that range from clay, silt, sand and gravel to occasional sandstone and limestone layers.

The formations dip to the southwest towards the coast with a dip of about 40 feet per mile. Although faults and folds exist at depth in the county, no faults or folds exist near the surface at or near the site.

The oldest unit exposed in Mobile County is the undifferentiated Miocene which is exposed in the Southern Pine Hills. The unit consists of marine and estuarine sediments which consist of laminated to thinly-bedded clays, sands and clayey sands. The sands range from fine to coarse-grained, Generally, the sediments are light colored to mottled.

The Pliocene-Pleistocene age Citronelle Formation overlies the undifferentiated Miocene in Mobile County. The Citronelle outcrops in the Southern Pine Hills caps many of the hills, ridges and plateaus in the Pine Hills (Figure 6). The Citronelle Formation consists of clay, clayey sands and sand with gravel mixed with the sands. In contrast to the underlying Miocene sediments , the Citronelle sediments generally vary in color from brown, red to orange due to the high iron content.

Along the southern and eastern portions of Mobile County relatively flat Pleistocene terraces occur. These terraces consist of marine , estuarine and alluvial deposits. These terraces which are situated in the Coastal Lowlands rest on the undifferentiated Miocene sediments. The sediments found within the terraces range from very fine to coarse- grained sand, gravel and clay. Some silt occurs in areas. The alluvial terraces in the vicinity of the site range to a depth of about 50 feet or more. The base of the deposits generally consists of coarse-grained sand with pea gravel. The upper 15 to 20 feet of the deposits consist of clay or sandy clay.

Holocene alluvium consisting of clay, silt, sand and some gravel and organic material occurs along streams , rivers and other drainage and water areas. Depths vary from over 100 feet in the Mobile –Tensaw Delta to a few feet in smaller drainage ways.

The site is situated on two different Pleistocene terraces which slope to the south and east. The highest terrace is located at an elevation of about 30 to 40 feet NGVD and extends from the base of the Pine Hills about 2.5 miles to the west to within .75 miles from the Mobile River (Figures 3 and 4). The lowest terrace extends from the above terrace to the river (Figure 4). Elevation of the lower terrace is between 18 and 24 feet NGVD. Both terraces consist of a top stratum layer of 15 to 20 feet of clay and sandy clay which overlies substratum sand with gravel to the undifferentiated Miocene.

HYDROGEOLOGY

The major aquifers in the area are the Pliocene-Miocene aquifer and the alluvial-coastal aquifer. Although units in each aquifer are lithologically different, they are hydraulically connected. They respond to stresses as a single aquifer.
Wells developed in the aquifer will yield between .5 Mgal per day to 2 Mgal per day depending on which geologic unit is developed as a source. Iron in excess of .3 mg/L occurs in areas. Generally the water is soft and low in dissolved solids.

The groundwater flow in Mobile County is generally to the south with some flow off the Pine Hills eastward towards the delta and bay.

Groundwater flow in the area of the site generally to the south and southeast. Surface water flow in the area of the site is similar to the groundwater flow.

MUNICIPAL WELLS

Five municipal and industrial wells are located within 4 miles of the site (Figure 7). Syngenta/Zeneca has two wells to the northwest. Lemoyne Water System, Inc has three wells to the south-southwest. All of the wells are screened at a depth of about 130-135 feet.

CONCLUSION

Any contamination at the site will probably follow the surface water drainage to the south or southeast. Any contamination which penetrates the low permeability top stratum clays will enter the substratum sand and flow south and southeast.

Cc: Dylan Hendrix, Assessment Section, Environmental Services Branch, Land Division.

REFERENCE 18

Alabama Department of Environmental Management	**Water Division**	**Drinking Water Branch**
County Map of AL	**Water System Search**	**Help**

Water System Facilities	Violations Enforcement Actions	TCR Sample Results	TTHM HAA5 Summaries
Sample Points	Assistance Actions	Recent Positive TCR Results	PBCU Summaries
Sample Schedules / FANLs / Plans	Compliance Schedules	Other Chemical Results	Chlorine Summaries
Site Visits Milestones	TOC/Alkalinity Results	Chemical Results by: Name Code	Turbidity Summaries
Operators All POC	LRAA (TTHM/HAA5)	Recent Non-TCR Sample Results	TCR Sample Summaries

Water System Detail Information

Water System No.:	AL0000994	Federal Type:	C
Water System Name:	LEMOYNE WATER SYSTEM, INC.	Federal Source:	GW
Principal County Served:	MOBILE	System Status:	A
Principal City Served:	AXIS	Activity Date:	06-01-1975

Water System Contacts

Type	Contact	Communication
AC - Administrative Contact	BRYAN, JAMES P.O. BOX 144 AXIS, AL 36505	Phone Type: BUS - Business Value: 251-675-1797
DO - Designated Operator	PARKER, LARRY 505 OCOCHAPPO VILLAGE CHEROKEE, AL 35616	

List of Operators Complete Point of Contact List

Sources of Water

Name	Type	Activity	Availability
WELL 1	WL	A	P
WELL 3	WL	A	P
WELL 2	WL	A	P

Source Water Percentages

Surface Water	0	Surface Water Purchased	0
Ground Water	100	Ground Water Purchased	0
Ground Water UDI	0	Ground Water UDI Purchased	0

Water Purchases

System No.	System Name	Facility ID	Facility Name	Water Finish

No Water Purchases

Buyers of Water	
Water System No.	**Name**
No Buyers	

Annual Operating Period(s)					
Effective Begin Date	**Effective End Date**	**Start Month/Day**	**End Month/Day**	**Type**	**Population**
01-01-2004	No End Date	1/1	12/31	R	3360

Service Connections			
Type	**Count**	**Meter Type**	**Meter Size**
RS	1259	ME	0

Service Area	
Code	**Name**
R	RESIDENTIAL AREA

Regulating Agencies	
Name	**Alias/Inspector**
ALABAMA DEPT. OF ENVIRONMENTAL MGT.	

Water System Historical Names
Historical Name(s)
LEMOYNE WATER SYSTEM INC.

System Certification Requirements		
Certification Name	**Code**	**Begin Date**

WS Flow Rates		
Type	**Quantity**	**UOM**
AVPD - Average Daily Production	438400	GPD
TLDS - Total Design Capacity	1458000	GPD
EMRG - Total Emergency Capacity	571000	GPD

WS Measures		
Type	**Quantity**	**UOM**

WS Indicators		
Type	**Value**	**Date**
SSWP - State Source Water Program	NO	03-12-2009

Alabama Department of Environmental Management	**Water Division**	**Drinking Water Branch**
County Map of AL	**Water System Search**	**Help**

Water System Facilities	Violations Enforcement Actions	TCR Sample Results	TTHM HAA5 Summaries
Sample Points	Assistance Actions	Recent Positive TCR Results	PBCU Summaries
Sample Schedules / FANLs / Plans	Compliance Schedules	Other Chemical Results	Chlorine Summaries
Site Visits Milestones	TOC/Alkalinity Results	Chemical Results by: Name Code	Turbidity Summaries
Operators All POC	LRAA (TTHM/HAA5)	Recent Non-TCR Sample Results	TCR Sample Summaries

Water System Detail Information

Water System No.:	AL0001037	Federal Type:	NTNC
Water System Name:	U.S. AMINES LLC- CELANESE CHEMICALS	Federal Source:	GW
Principal County Served:	MOBILE	System Status:	A
Principal City Served:	BUCKS	Activity Date:	04-01-1975

Water System Contacts

Type	Contact	Communication	
		Phone Type	**Value**
AC - Administrative Contact	BURR, ELDON J. P.O. BOX 64 BUCKS, AL 36512	BUS - Business	251-829-6601
		FAX - Facsimile	251-829-3739

List of Operators Complete Point of Contact List

Sources of Water

Name	Type	Activity	Availability
WELL 4-- SERVES ADMINISTRATION BLD.	WL	A	P
WELL PW-1 (BACKUP WELL FOR PW-2)	WL	A	P
WELL PW-2 (BY ENTRANCE GATE HWY 43)	WL	A	P

Source Water Percentages

Surface Water	0	Surface Water Purchased	0
Ground Water	100	Ground Water Purchased	0
Ground Water UDI	0	Ground Water UDI Purchased	0

Water Purchases

System No.	System Name	Facility ID	Facility Name	Water Finish

No Water Purchases

Buyers of Water	
Water System No.	**Name**
No Buyers	

Annual Operating Period(s)					
Effective Begin Date	**Effective End Date**	**Start Month/Day**	**End Month/Day**	**Type**	**Population**
01-01-2004	No End Date	1/1	12/31	NT	50

Service Connections			
Type	**Count**	**Meter Type**	**Meter Size**
CM	2	ME	0

Service Area	
Code	**Name**
NT	INDUSTRIAL/AGRICULTURAL

Regulating Agencies	
Name	**Alias/Inspector**
ALABAMA DEPT. OF ENVIRONMENTAL MGT.	

Water System Historical Names
Historical Name(s)

System Certification Requirements		
Certification Name	**Code**	**Begin Date**

WS Flow Rates		
Type	**Quantity**	**UOM**
AVPD - Average Daily Production	10000	GPD
MDLP - MAXIMUM DAILY PRODUCTION	15000	GPD

WS Measures		
Type	**Quantity**	**UOM**

WS Indicators		
Type	**Value**	**Date**
SSWP - State Source Water Program	NO	03-12-2009

Alabama Department of Environmental Management	Water Division	Drinking Water Branch
County Map of AL	Water System Search	Help

Water System Facilities	Violations Enforcement Actions	TCR Sample Results	TTHM HAA5 Summaries
Sample Points	Assistance Actions	Recent Positive TCR Results	PBCU Summaries
Sample Schedules / FANLs / Plans	Compliance Schedules	Other Chemical Results	Chlorine Summaries
Site Visits Milestones	TOC/Alkalinity Results	Chemical Results by: Name Code	Turbidity Summaries
Operators All POC	LRAA (TTHM/HAA5)	Recent Non-TCR Sample Results	TCR Sample Summaries

Water System Detail Information

Water System No.:	AL0001028	Federal Type:	NTNC
Water System Name:	SYNGENTA / ZENECA CROP PROTECTION, INC.	Federal Source:	GW
Principal County Served:	MOBILE	System Status:	I
Principal City Served:		Activity Date:	10-06-2009

Water System Contacts

Type	Contact	Communication	
		Electronic Type	Value
AC - Administrative Contact	SULLIVAN, RICK P O BOX 32 BUCKS, AL 36512	EMAIL - Email	RickSullivan@Syngenta.com
		Phone Type	Value
		BUS - Business	251-675-0950

List of Operators Complete Point of Contact List

Sources of Water

Name	Type	Activity	Availability
WELL #CC-11	WL	A	P
WELL #CC-13	WL	A	P
WELL CC-12 IS ABANDONED	WL	I	O

Source Water Percentages

Surface Water	0	Surface Water Purchased	0
Ground Water	100	Ground Water Purchased	0
Ground Water UDI	0	Ground Water UDI Purchased	0

Water Purchases

System No.	System Name	Facility ID	Facility Name	Water Finish

No Water Purchases

Buyers of Water	
Water System No.	**Name**
No Buyers	

Annual Operating Period(s)					
Effective Begin Date	**Effective End Date**	**Start Month/Day**	**End Month/Day**	**Type**	**Population**
01-01-2004	No End Date	1/1	12/31	NT	58

Service Connections			
Type	**Count**	**Meter Type**	**Meter Size**
CM	1	ME	0

Service Area	
Code	**Name**
NT	INDUSTRIAL/AGRICULTURAL

Regulating Agencies	
Name	**Alias/Inspector**
ALABAMA DEPT. OF ENVIRONMENTAL MGT.	

Water System Historical Names
Historical Name(s)

System Certification Requirements		
Certification Name	**Code**	**Begin Date**

WS Flow Rates		
Type	**Quantity**	**UOM**
AVPD - Average Daily Production	5000	GPD
EMRG - Total Emergency Capacity	7500	GPD

WS Measures		
Type	**Quantity**	**UOM**

WS Indicators		
Type	**Value**	**Date**
SSWP - State Source Water Program	NO	03-12-2009

REFERENCE 19

Syngenta Crop Protection, Inc. Tel 251 675 0950
13500 U. S. Highway 43 Fax 251 675-5948
P.O. Box 32
Bucks, Al 36512
www.syngenta.com

syngenta

BY FEDERAL EXPRESS

RECEIVED
FEB 2010
LAND DIVISION

February 8, 2010

Mr. Clethes Stallworth, Chief
Compliance and Enforcement Section
Industrial Hazardous Waste Branch
Land Division,
Alabama Department of Environmental Management
1400 Coliseum Blvd.
Montgomery, AL 36110-2059

Syngenta Crop Protection, Inc. - Cold Creek Plant
EPA ID # ALD095688875

Dear Mr. Stallworth,

When Syngenta responded to the Warning Letter following the inspection of November 5, 2009, we indicated that we would revert to you with notification of closure activities for the less than 90-day hazardous waste storage ("accumulation") areas at the Syngenta Cold Creek Facility in Bucks, Alabama. The enclosed Closure Sampling Plan (2 copies) is this follow-up. The Closure Sampling Plan describes activity Syngenta intends to conduct to discover the condition of the former hazardous waste accumulation areas. The goal of sampling is to determine if the concrete slabs that contained the accumulation areas can be left on site after the facility is demolished.

Demolition is scheduled to begin within the next few weeks. In order for this to proceed in the affected areas we need to have a determination about the fate of the concrete accumulation areas. To accomplish this, we request a meeting some time during the last week of February 2010 where Syngenta and our consultants, ERM Southwest, can present the Closure Sampling Plan and discuss ADEM's response to it. I will call Ms. Linda Knickerbocker to schedule a meeting at your convenience during this week.

If you have questions while reviewing the Plan, please do not hesitate to contact me by phone at (336) 632-5769 or by e-mail at nick.burrows@syngenta.com

Sincerely,

N. P. Burrows
Senior Environmental Manger – NAFTA

Enclosures

REFERENCE 20

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WATER DIVISION - WATER QUALITY PROGRAM

CHAPTER 335-6-11
WATER USE CLASSIFICATIONS FOR INTERSTATE AND INTRASTATE WATERS

TABLE OF CONTENTS

335-6-11-.01 <u>The Use Classification System</u>.

(1) Use classifications utilized by the State of Alabama are as follows:

Outstanding Alabama Water	OAW
Public Water Supply	PWS
Swimming and Other Whole Body Water-Contact Sports	S
Shellfish Harvesting	SH
Fish and Wildlife	F&W
Limited Warmwater Fishery	LWF
Agricultural and Industrial Water Supply	A&I

(2) Use classifications apply water quality criteria adopted for particular uses based on existing utilization, uses reasonably expected in the future, and those uses not now possible because of correctable pollution but which could be made if the effects of pollution were controlled or eliminated. Of necessity, the assignment of use classifications must take into consideration the physical capability of waters to meet certain uses.

(3) Those use classifications presently included in the standards are reviewed informally by the Department's staff as the need arises, and the entire standards package, to include the use classifications, receives a formal review at least once each three years. Efforts currently underway through local 201 planning projects will provide additional technical data on certain streams in the State, information on treatment alternatives, and applicability of various management techniques, which, when available, will hopefully lead to new decisions regarding use classifications. Of particular interest are those segments which are currently classified for any usage which has an associated degree of quality criteria considered to be less than that applicable to a classification of "Fish and Wildlife." As rapidly as it can be demonstrated that new classifications are feasible and attainable on these segments from an economic and technological viewpoint, based on the information being generated pursuant to water quality studies and the planning efforts previously outlined, such improvement will be proposed. For those segments where such a demonstration cannot be made, use attainability analyses describing in detail

the factors preventing attainment of the "Fish and Wildlife" use will be prepared pursuant to federal requirements and updated as new information becomes available.

(4) Although it is not explicitly stated in the classifications, it should be understood that the use classification of "Shellfish Harvesting" is only applicable in the coastal area and, therefore, is included only in the Mobile River Basin and the Perdido-Escambia River Basin. It should also be noted that with the exception of those segments in the "Public Water Supply" classification, every segment, in addition to being considered acceptable for its designated use, is also considered acceptable for any other use with a less stringent associated criteria.

(5) Not all waters are included by name in the use classifications since it would be a tremendous administrative burden to list all stream segments in the State. In addition, in virtually every instance where a segment is not included by name, the Department has no information or stream data upon which to base a decision relative to the assignment of a particular classification. An effort has been made, however, to include all major stream segments and all segments which, to the Department's knowledge, are currently recipients of point source discharges. Those segments which are not included by name will be considered to be acceptable for a "Fish and Wildlife" classification unless it can be demonstrated that such a generalization is inappropriate in specific instances.

Author: James E. McIndoe.
Statutory Authority: Code of Alabama 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
History: May 5, 1967. **Amended:** June 19, 1967; April 1, 1970; October 16, 1972; September 17, 1973; May 30, 1977; December 19, 1977; February 4, 1981; April 5, 1982; December 11, 1985; March 26, 1986; September 7, 2000; May 27, 2008.

335-6-11-.02 Use Classifications.

(1) THE ALABAMA RIVER BASIN

INTERSTATE WATERS

Stream	From	To	Classification
ALABAMA RIVER	MOBILE RIVER	Claiborne Lock and Dam	F&W
ALABAMA RIVER	Claiborne Lock and Dam	Frisco Railroad Crossing	S/F&W
ALABAMA RIVER	Frisco Railroad Crossing	River Mile 131	F&W

Stream	From	To	Classification
James Creek	Bassett Creek (Clarke Co.)	Its source	F&W
Jackson Creek	TOMBIGBEE RIVER	Its source	F&W
Satilpa Creek	TOMBIGBEE RIVER	Its source	S/F&W
Santa Bogue Creek	TOMBIGBEE RIVER	Its source	S/F&W
Turkey Creek	TOMBIGBEE RIVER	Its source	S/F&W
Bashi Creek	TOMBIGBEE RIVER	Its source	S/F&W
Tishlarka Creek	TOMBIGBEE RIVER	Its source	F&W
Wahalak Creek	Tishlarka Creek	Its source	F&W
Horse Creek	TOMBIGBEE RIVER	Its source	S/F&W
Beaver Creek	TOMBIGBEE RIVER	Its source	S/F&W
Kinterbish Creek	TOMBIGBEE RIVER	Its source	S/F&W
Chickasaw Bogue	TOMBIGBEE RIVER	Its source	F&W
Sycamore Creek	Chickasaw Bogue	Its source	F&W
Unnamed tributary southwest of York (Lake Louise)	Toomsuba Creek	Its source	PWS

(9) THE MOBILE RIVER-MOBILE BAY BASIN

INTERSTATE AND COASTAL WATERS

Stream	From	To	Classification
Mobile River and all other rivers, creeks, lakes of the Mobile River Delta and their tributaries except as otherwise designated			F&W
MOBILE RIVER	Barry Steam Plant	Tensaw River	PWS/F&W
MOBILE RIVER	Its mouth	Spanish River	LWF[4]

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[4] For the purpose of establishing effluent limitations pursuant to chapter 335-6-6 of the Department's regulations, the minimum 7-day low flow that occurs once in 10 years ($7Q_{10}$) shall be the basis for applying the chronic aquatic life criteria.

REFERENCE 21

Alabama Ecological Services Office

Southeast Region

- ES Finder
- Service Finder
- Office Finder
- Alabama Ecological Services Home

- General Information
- Backyard Habitat
- Hunting/Fishing Information
- Information for Students and Teachers
- Office Highlights
- Outreach/Media
- Staff Directory
- Volunteer
- Frequently Asked Questions

- Program Information
- Coastal Program
- Endangered Species
    - Endangered Species Information
    - Species Listed by County
    - Alabama Beach Mouse
        - ABM Biology
        - ABM Habitat
        - ABM Critical Habitat
        - ABM Habitat Conservation Planning
    - Bald Eagle Protocol
    - Gopher Tortoise
    - Gulf Sturgeon
    - Red-Cockaded Woodpecker
    - Sea Turtles
    - West Indian Manatee
- Environmental Contaminants
- Landowner Information
    - Conservation Banking
    - Candidate Conservation Agreements
    - Habitat Conservation Planning (HCP)
    - Safe Harbor Agreements
- Migratory Birds
- Partners for Fish and Wildlife
- Section 7 Consultation
- Strategic Habitat Units (SHU's)
- Tower Site Forms and Information

Alabama's Federally Listed Species

Alabama map. Credit: USFWS

By County - April, 2011

The Alabama County Species lists will now be maintained through our ECOS website. We will still provide critical habitat lists on this page but you will not need to click on the county name to access the county list through ECOS. We are continually updating this list and, therefore, it may be incomplete and is provided strictly for informational purposes. This list does not constitute any form of Section 7 consultation. We recommend that you contact our office (Daphne, AL Field Office - USFWS) for more current, site specific information prior to project activities. To be certain of occurrence, surveys should be conducted by qualified biologists to determine if a Federally protected species occurs within a project area. Locations of designated critical habitat have also been included for your information. You can also take a look at our critical habitat web portal, featuring CH maps across the country.

Alabama Counties: Autauga / Baldwin / Barbour / Bibb / Blount / Bullock / Butler / Calhoun / Chambers / Cherokee / Chilton / Choctaw / Clarke / Clay / Cleburne / Coffee / Colbert / Conecuh / Coosa / Covington / Crenshaw / Cullman / Dale / Dallas / DeKalb / Elmore / Escambia / Etowah / Fayette / Franklin / Geneva / Greene / Hale / Henry / Houston / Jackson / Jefferson / Lamar / Lauderdale / Lawrence / Lee / Limestone / Lowndes / Macon / Madison / Marengo / Marion / Marshall / Mobile / Monroe / Montgomery / Morgan / Perry / Pickens / Pike / Randolph / Russell / Shelby / St. Clair / Sumter / Talladega / Tallapoosa / Tuscaloosa / Walker / Washington / Wilcox / Winston

>>>>>>>>>>Click on county name below for species list<<<<<<<<<<

Autauga **<==Click here for county list**

Critical Habitat:

- Species - Alabama Sturgeon, Southern Clubshell, Orange-nacre Mucket
- Location - Alabama River

Baldwin **<==Click here for county list**

Critical Habitat:

- Species - Alabama sturgeon, Southern clubshell, Orange-nacre mucket, Alabama beach mouse, Perdido Key beach mouse
- Location - Alabama River, Ft. Morgan Peninsula, Perdido Key

Barbour **<==Click here for county list**

Bibb **<==Click here for county list**

Group	Name	Population	Status	Lead Office	Recovery Plan Name	Recovery Plan Stage
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Recovery Plan for the Pacific	Final
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Southwestern Bald Eagle	Final
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Chesapeake Bay Bald Eagle	Final Revision 1
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Northern States Bald Eagle	Final
Birds	Bald eagle (Haliaeetus	lower 48 States	Recovery	Rock Island Ecological Services	Southeastern States Bald Eagle	Final Revision 1
Birds	Wood stork (Mycteria	AL, FL, GA, SC	Endangered	North Florida Ecological	Revised Recovery Plan for the	Final Revision 1
Birds	Piping Plover (Charadrius	except Great Lakes watershed	Threatened	Office Of The Regional Director	Great Lakes & Northern Great	Final
Birds	Piping Plover (Charadrius	except Great Lakes watershed	Threatened	Office Of The Regional Director	Piping Plover Atlantic Coast	Final Revision 1
Fishes	Gulf sturgeon (Acipenser		Threatened	Panama City Ecological	Gulf Sturgeon	Final
Mammals	West Indian manatee		Endangered	North Florida Ecological	Florida Manatee Recovery Plan,	Final Revision 3
Mammals	West Indian manatee		Endangered	North Florida Ecological	Recovery Plan Puerto Rican	Final
Reptiles	Hawksbill sea turtle		Endangered	North Florida Ecological	Recovery Plan for the Hawksbill	Final Revision 1
Reptiles	Hawksbill sea turtle		Endangered	North Florida Ecological	Recovery Plan for U.S. Pacific	Final Revision 1
Reptiles	Leatherback sea turtle		Endangered	North Florida Ecological	Recovery Plan for U.S. Pacific	Final Revision 1
Reptiles	Leatherback sea turtle		Endangered	North Florida Ecological	Recovery Plan for Leatherback	Final Revision 1
Reptiles	Kemp's ridley sea turtle		Endangered	Corpus Christi Ecological	Draft Bi-National Recovery Plan	Draft Revision 2
Reptiles	Green sea turtle (Chelonia	except where endangered	Threatened	North Florida Ecological	Recovery Plan for U.S. Pacific	Final Revision 1
Reptiles	Green sea turtle (Chelonia	except where endangered	Threatened	North Florida Ecological	Recovery Plan for U.S.	Final Revision 1
Reptiles	Loggerhead sea turtle (Caretta		Threatened	North Florida Ecological	Recovery Plan for the Northwest	Final Revision 2
Reptiles	Loggerhead sea turtle (Caretta		Threatened	North Florida Ecological	Recovery Plan for U.S. Pacific	Final Revision 1
Reptiles	Alabama red-belly turtle		Endangered	Mississippi Ecological Services	Alabama Red-bellied Turtle	Final
Reptiles	Eastern indigo snake		Threatened	Mississippi Ecological Services	Eastern Indigo Snake	Final
Reptiles	Black pine snake (Pituophis		Candidate	Mississippi Ecological Services		
Reptiles	Gopher tortoise (Gopherus	W of of Mobile/Tombigbee Rs.	Threatened	Mississippi Ecological Services	Gopher Tortoise	Final

REFERENCE 22

Water-Data Report 2010

02470629 MOBILE RIVER AT RIVER MILE 31.0 AT BUCKS, AL

Mobile Basin

LOCATION.--Lat 31°00'56", long 88°01'15" referenced to North American Datum of 1927, Mobile County, AL, Hydrologic Unit 03170008, on right bank, 0.3 mi east of U.S. Highway 43, 0.5 mi upstream of Barry Steam Plant, 10.0 mi downstream of the Old Fort Stoddard Boat Ramp in Mt. Vernon, and at river mile 31.0.

DRAINAGE AREA.--43,000 mi².

SURFACE-WATER RECORDS

PERIOD OF RECORD.--July 2003 to Current Year.

GAGE.--Water-stage and velocity recorder. Datum of gage is NGVD of 1929.

REMARKS.--Estimated daily discharges: Oct. 7-29, May 2-4, and Sept. 30. Records fair, except those estimated

and during overbank flow conditions, which are poor.

EXTREMES FOR PERIOD OF RECORD.--Minimum discharge estimated from rating extension to be -30,400 ft³/s, Aug. 29, 2005.

EXTREMES OUTSIDE PERIOD OF RECORD.--The peak discharge for the flood of March 1961, was estimated to be 538,000 ft³/s based on a stage-discharge rating that was developed for station 02470630, 0.5 mi downstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 64,900 ft³/s, Mar. 17, elevation, 7.29 ft; minimum discharge, -13,200 ft³/s, July 22, elevation, 1.88 ft.

02470629 MOBILE RIVER AT RIVER MILE 31.0 AT BUCKS, AL—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

[e, estimated; &, channel flow only]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	60,400	39,500	32,000	55,200	&44,200	39,200	37,500	43,000	29,600	14,500	6,750	6,150
2	58,200	41,100	33,100	56,800	&44,400	38,300	35,300	e40,400	30,200	12,600	5,860	6,390
3	55,600	43,000	41,300	56,700	&47,000	39,500	33,400	e39,800	30,900	11,000	5,760	6,830
4	52,000	44,600	45,400	55,500	51,300	41,800	31,500	e42,900	31,300	9,180	6,130	5,690
5	47,600	45,600	48,400	54,300	53,600	43,500	30,200	49,000	30,700	7,820	8,650	3,410
6	43,800	45,500	49,600	52,300	55,800	43,500	28,000	52,100	30,300	7,260	6,740	2,540
7	e39,600	42,900	49,400	49,100	58,100	41,500	26,200	54,300	30,300	9,090	5,790	3,550
8	e36,400	39,300	48,600	47,200	59,100	38,800	26,600	56,000	28,000	9,660	6,920	2,880
9	e43,100	35,600	48,300	44,500	54,400	34,500	27,200	56,800	24,100	8,840	5,230	3,690
10	e40,700	34,100	49,500	41,700	&48,600	32,200	27,700	54,600	19,000	7,860	4,430	4,490
11	e39,600	39,900	51,400	37,500	&45,300	37,600	31,800	50,200	16,200	7,150	4,380	7,710
12	e46,000	46,800	53,800	34,800	&43,500	45,100	33,300	44,800	19,700	6,600	4,780	8,030
13	e44,400	51,700	57,100	32,300	&42,700	50,400	31,900	39,100	19,900	8,640	7,890	5,210
14	e43,900	55,600	60,500	30,000	&43,300	55,800	28,900	34,700	16,400	7,650	10,200	2,780
15	e45,800	59,300	62,600	28,400	&44,500	61,000	25,100	28,500	12,300	6,950	6,110	2,210
16	e50,300	61,300	60,700	27,300	50,900	63,400	21,300	24,000	13,200	5,500	10,400	2,690
17	e54,000	60,700	&52,700	30,200	55,800	63,000	17,700	21,900	10,800	7,880	2,910	3,510
18	e57,400	59,100	&47,200	34,400	56,000	54,300	17,100	22,400	14,100	12,200	10,900	3,600
19	e59,600	57,600	&45,400	37,900	54,900	&47,000	15,900	23,000	16,000	12,700	9,460	3,220
20	e60,400	56,300	&44,700	40,900	53,100	&44,400	14,700	21,800	16,100	9,040	10,900	3,010
21	e59,800	54,500	&44,600	45,100	51,000	&44,500	13,200	21,100	14,400	8,260	9,960	2,450
22	e58,100	52,000	&44,000	49,400	48,800	50,100	15,400	24,500	12,600	6,830	8,250	2,540
23	e55,700	49,300	&43,600	52,100	47,200	54,200	14,500	30,800	11,200	9,400	6,290	2,110
24	e52,800	46,800	&43,600	55,600	46,600	53,300	13,100	37,400	9,640	6,140	5,860	2,340
25	e50,000	44,600	&43,100	59,300	46,400	51,500	22,600	39,600	9,010	5,820	5,580	4,970
26	e47,300	43,000	&43,700	62,000	45,500	49,700	31,700	39,700	8,750	5,880	6,100	5,070
27	e44,700	42,000	&45,200	62,900	44,200	47,400	37,900	39,500	7,700	8,640	7,250	4,920
28	e42,500	38,600	&48,000	61,100	41,600	45,200	42,200	37,700	8,740	12,200	6,370	5,410
29	e41,000	34,800	51,400	54,700	---	44,800	43,700	33,400	10,600	12,900	5,800	5,920
30	39,200	33,200	53,500	&46,200	---	43,000	44,600	29,800	9,560	9,710	5,460	e5,060
31	38,900	---	54,100	&44,500	---	40,500	---	29,500	---	8,120	6,380	---
Mean	48,670	46,610	48,270	46,450	49,210	46,420	27,340	37,490	18,040	8,904	6,887	4,279
Max	60,400	61,300	62,600	62,900	59,100	63,400	44,600	56,800	31,300	14,500	10,900	8,030
Min	36,400	33,200	32,000	27,300	41,600	32,200	13,100	21,100	7,700	5,500	2,910	2,110

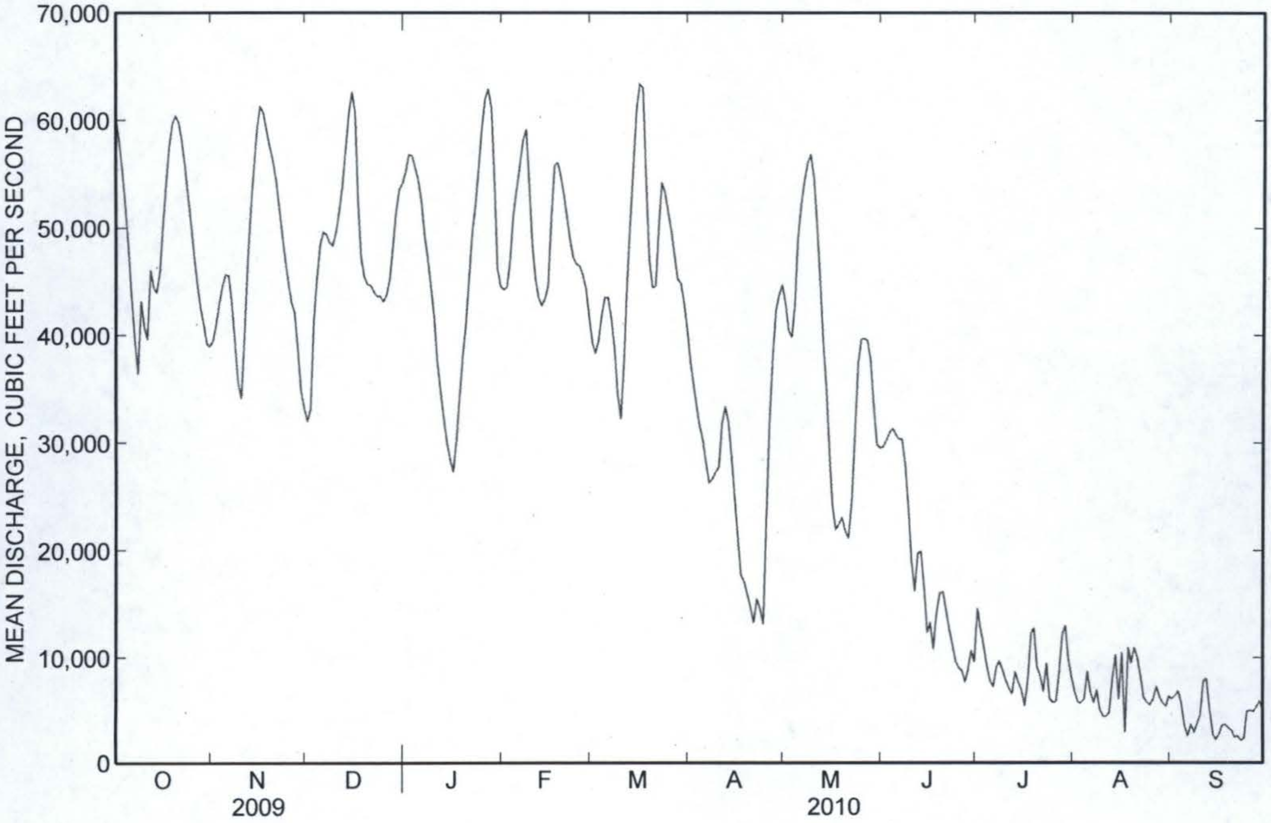
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 2003 - 2010, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	15,500	21,020	31,980	36,060	40,430	41,220	29,300	25,720	17,550	14,250	13,470	13,930
Max	48,670	46,610	58,330	46,920	54,700	56,150	50,260	48,460	38,830	40,520	30,800	29,370
(WY)	(2010)	(2010)	(2005)	(2009)	(2004)	(2009)	(2005)	(2009)	(2005)	(2005)	(2003)	(2009)
Min	6,380	5,040	5,674	12,380	19,910	17,590	10,830	4,723	4,247	5,005	3,335	3,140
(WY)	(2008)	(2008)	(2008)	(2008)	(2009)	(2007)	(2007)	(2007)	(2007)	(2006)	(2007)	(2007)

02470629 MOBILE RIVER AT RIVER MILE 31.0 AT BUCKS, AL—Continued

SUMMARY STATISTICS

	Calendar Year 2009		Water Year 2010		Water Years 2003 - 2010	
Annual mean	36,280		32,330		24,740	
Highest annual mean					35,850	2005
Lowest annual mean					14,220	2007
Highest daily mean	71,800	Jan 14	63,400	Mar 16	71,800	Jan 14, 2009
Lowest daily mean	3,520	Aug 17	2,110	Sep 23	-5,810	Aug 29, 2005
Annual seven-day minimum	6,790	Jul 1	2,750	Sep 18	1,770	Sep 20, 2007
Maximum peak flow			64,900	Mar 17	72,900	Jan 14, 2009
Maximum peak stage			10.41	Dec 25	11.96	Apr 4, 2009
10 percent exceeds	60,400		55,600		54,300	
50 percent exceeds	41,000		37,900		19,100	
90 percent exceeds	9,250		5,840		4,460	

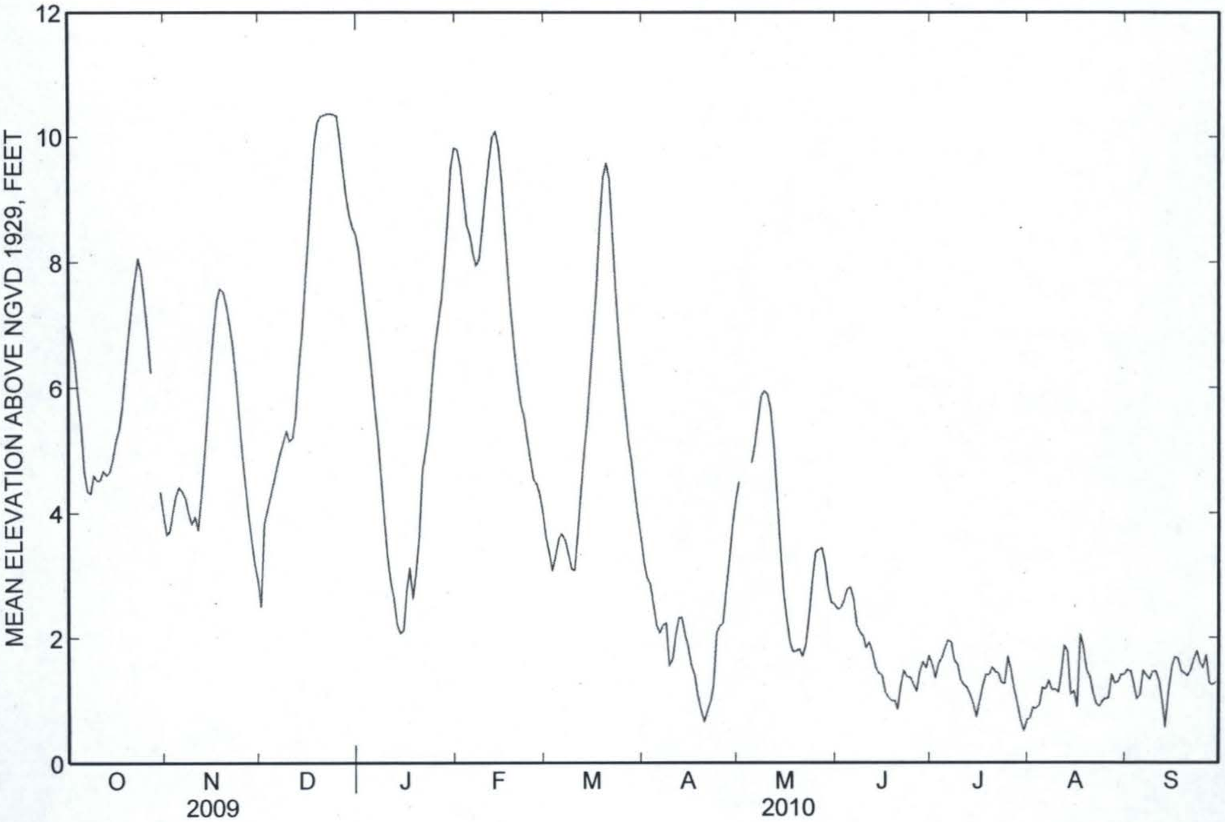


02470629 MOBILE RIVER AT RIVER MILE 31.0 AT BUCKS, AL—Continued

ELEVATION ABOVE NGVD 1929, FEET
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	6.97	3.65	2.50	8.16	9.79	3.61	3.21	4.49	2.46	1.58	0.71	1.49
2	6.77	3.71	3.83	7.70	9.53	3.38	2.97	---	2.48	1.36	0.89	1.47
3	6.40	4.00	4.05	7.21	9.08	3.08	2.86	---	2.59	1.59	0.87	1.26
4	5.91	4.27	4.26	6.75	8.59	3.31	2.54	---	2.77	1.67	0.92	1.02
5	5.40	4.41	4.46	6.21	8.43	3.59	2.20	4.80	2.81	1.83	1.21	1.08
6	4.66	4.34	4.72	5.65	8.13	3.67	2.08	5.10	2.62	1.96	1.18	1.48
7	4.35	4.23	4.92	5.20	7.94	3.57	2.20	5.49	2.20	1.93	1.32	1.41
8	4.31	4.00	5.11	4.54	8.05	3.35	2.24	5.85	2.09	1.64	1.17	1.34
9	4.60	3.82	5.30	3.89	8.56	3.11	1.56	5.94	2.03	1.58	1.18	1.46
10	4.52	3.94	5.13	3.29	9.11	3.08	1.65	5.89	1.84	1.33	1.13	1.47
11	4.52	3.73	5.18	2.89	9.58	3.70	2.04	5.64	1.93	1.26	1.46	1.32
12	4.67	4.26	5.55	2.62	9.98	4.37	2.32	5.06	1.77	1.21	1.88	0.98
13	4.60	4.90	6.32	2.21	10.08	4.92	2.33	4.26	1.53	1.10	1.79	0.57
14	4.64	5.56	6.86	2.07	9.84	5.46	2.05	3.45	1.44	0.95	1.09	1.12
15	4.84	6.29	7.64	2.13	9.31	6.18	1.86	2.73	1.41	0.73	1.15	1.53
16	5.14	6.92	8.31	2.78	8.55	6.89	1.56	2.30	1.15	0.99	0.89	1.69
17	5.32	7.39	9.14	3.12	7.81	7.63	1.42	1.92	1.05	1.23	2.05	1.68
18	5.69	7.58	9.87	2.63	7.18	8.63	1.08	1.78	1.00	1.42	1.86	1.48
19	6.28	7.53	10.22	3.07	6.64	9.36	0.85	1.79	1.00	1.41	1.49	1.44
20	6.86	7.31	10.32	3.64	6.15	9.58	0.66	1.82	0.86	1.53	1.39	1.39
21	7.32	7.00	10.34	4.67	5.75	9.32	0.83	1.70	1.24	1.46	1.13	1.48
22	7.72	6.66	10.36	4.99	5.52	8.53	0.99	1.90	1.48	1.44	0.95	1.66
23	8.06	6.16	10.36	5.37	5.18	7.61	1.24	2.35	1.38	1.29	0.90	1.79
24	7.84	5.54	10.35	6.09	4.85	6.84	2.08	2.90	1.37	1.27	0.98	1.62
25	7.38	4.98	10.33	6.68	4.54	6.21	2.19	3.36	1.26	1.70	1.03	1.52
26	6.84	4.49	9.97	7.05	4.46	5.70	2.23	3.41	1.15	1.48	1.04	1.73
27	6.24	3.99	9.50	7.42	4.29	5.17	2.76	3.44	1.47	1.17	1.42	1.28
28	---	3.57	9.08	7.97	3.99	4.83	3.25	3.19	1.62	0.95	1.28	1.25
29	---	3.18	8.75	8.67	---	4.36	3.80	2.81	1.52	0.68	1.30	1.29
30	4.33	2.93	8.55	9.52	---	3.95	4.20	2.57	1.71	0.51	1.42	---
31	3.98	---	8.44	9.82	---	3.61	---	2.54	---	0.69	1.42	---
Mean	---	5.01	7.41	5.29	7.53	5.37	2.11	---	1.71	1.32	1.24	---
Max	---	7.58	10.36	9.82	10.08	9.58	4.20	---	2.81	1.96	2.05	---
Min	---	2.93	2.50	2.07	3.99	3.08	0.66	---	0.86	0.51	0.71	---

02470629 MOBILE RIVER AT RIVER MILE 31.0 AT BUCKS, AL—Continued



REFERENCE 23

Mobile County, Alabama

People QuickFacts	Mobile County	Alabama
Population, 2011 estimate	NA	4,802,740
Population, 2010	412,992	4,779,736
Population, percent change, 2000 to 2010	3.3%	7.5%
Population, 2000	399,843	4,447,100
Persons under 5 years, percent, 2010	6.8%	6.4%
Persons under 18 years, percent, 2010	25.1%	23.7%
Persons 65 years and over, percent, 2010	12.9%	13.8%
Female persons, percent, 2010	52.0%	51.5%
White persons, percent, 2010 (a)	60.2%	68.5%
Black persons, percent, 2010 (a)	34.6%	26.2%
American Indian and Alaska Native persons, percent, 2010 (a)	0.9%	0.6%
Asian persons, percent, 2010 (a)	1.8%	1.1%
Native Hawaiian and Other Pacific Islander, percent, 2010 (a)	0.0%	Z
Persons reporting two or more races, percent, 2010	1.5%	1.5%
Persons of Hispanic or Latino origin, percent, 2010 (b)	2.4%	3.9%
White persons not Hispanic, percent, 2010	59.1%	67.0%
Living in same house 1 year & over, 2006-2010	85.7%	84.3%
Foreign born persons, percent, 2006-2010	3.2%	3.4%
Language other than English spoken at home, pct age 5+, 2006-2010	4.8%	4.9%
High school graduates, percent of persons age 25+, 2006-2010	82.3%	81.4%
Bachelor's degree or higher, pct of persons age 25+, 2006-2010	19.8%	21.7%
Veterans, 2006-2010	35,780	408,032
Mean travel time to work (minutes), workers age 16+, 2006-2010	24.1	23.9
Housing units, 2010	178,196	2,171,853
Homeownership rate, 2006-2010	68.4%	71.1%
Housing units in multi-unit structures, percent, 2006-2010	17.7%	15.5%
Median value of owner-occupied housing units, 2006-2010	$120,700	$117,600
Households, 2006-2010	153,302	1,821,210
Persons per household, 2006-2010	2.61	2.53
Per capita money income in past 12 months (2010 dollars) 2006-2010	$21,548	$22,984
Median household income 2006-2010	$40,996	$42,081
Persons below poverty level, percent, 2006-2010	19.2%	17.1%

Business QuickFacts	Mobile County	Alabama
Private nonfarm establishments, 2009	9,016	100,805[1]
Private nonfarm employment, 2009	150,599	1,612,258[1]
Private nonfarm employment, percent change 2000-2009	-3.7%	-2.5%[1]
Nonemployer establishments, 2009	28,736	305,420
Total number of firms, 2007	34,836	382,350
Black-owned firms, percent, 2007	18.8%	14.8%

American Indian- and Alaska Native-owned firms, percent, 2007	S	0.8%
Asian-owned firms, percent, 2007	2.4%	1.8%
Native Hawaiian and Other Pacific Islander-owned firms, percent, 2007	F	0.1%
Hispanic-owned firms, percent, 2007	1.2%	1.2%
Women-owned firms, percent, 2007	29.5%	28.1%
Manufacturers shipments, 2007 ($1000)	12,407,151	112,858,843
Merchant wholesaler sales, 2007 ($1000)	3,268,730	52,252,752
Retail sales, 2007 ($1000)	5,225,494	57,344,851
Retail sales per capita, 2007	$12,895	$12,364
Accommodation and food services sales, 2007 ($1000)	562,436	6,426,342
Building permits, 2010	1,026	11,261
Federal spending, 2009	4,379,855	56,047,825[1]

Geography QuickFacts	**Mobile County**	**Alabama**
Land area in square miles, 2010	1,229.44	50,645.33
Persons per square mile, 2010	335.9	94.4
FIPS Code	097	01
Metropolitan or Micropolitan Statistical Area	Mobile, AL Metro Area	

1: Includes data not distributed by county.

Population estimates for counties will be available in April, 2012 and for cities in June, 2012.

(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.

D: Suppressed to avoid disclosure of confidential information
F: Fewer than 100 firms
FN: Footnote on this item for this area in place of data
NA: Not available
S: Suppressed; does not meet publication standards
X: Not applicable
Z: Value greater than zero but less than half unit of measure shown

Source U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds Report
Last Revised: Tuesday, 31-Jan-2012 16:47:22 EST

REFERENCE 24

Earth

Overview of Google Earth

Google Earth allows you to travel the world through a virtual globe and view satellite imagery, maps, terrain, 3D buildings, and much more. With Google Earth's rich, geographical content, you are able to experience a more realistic view of the world. You can fly to your favorite place, search for businesses and even navigate through directions. It's all up to you!

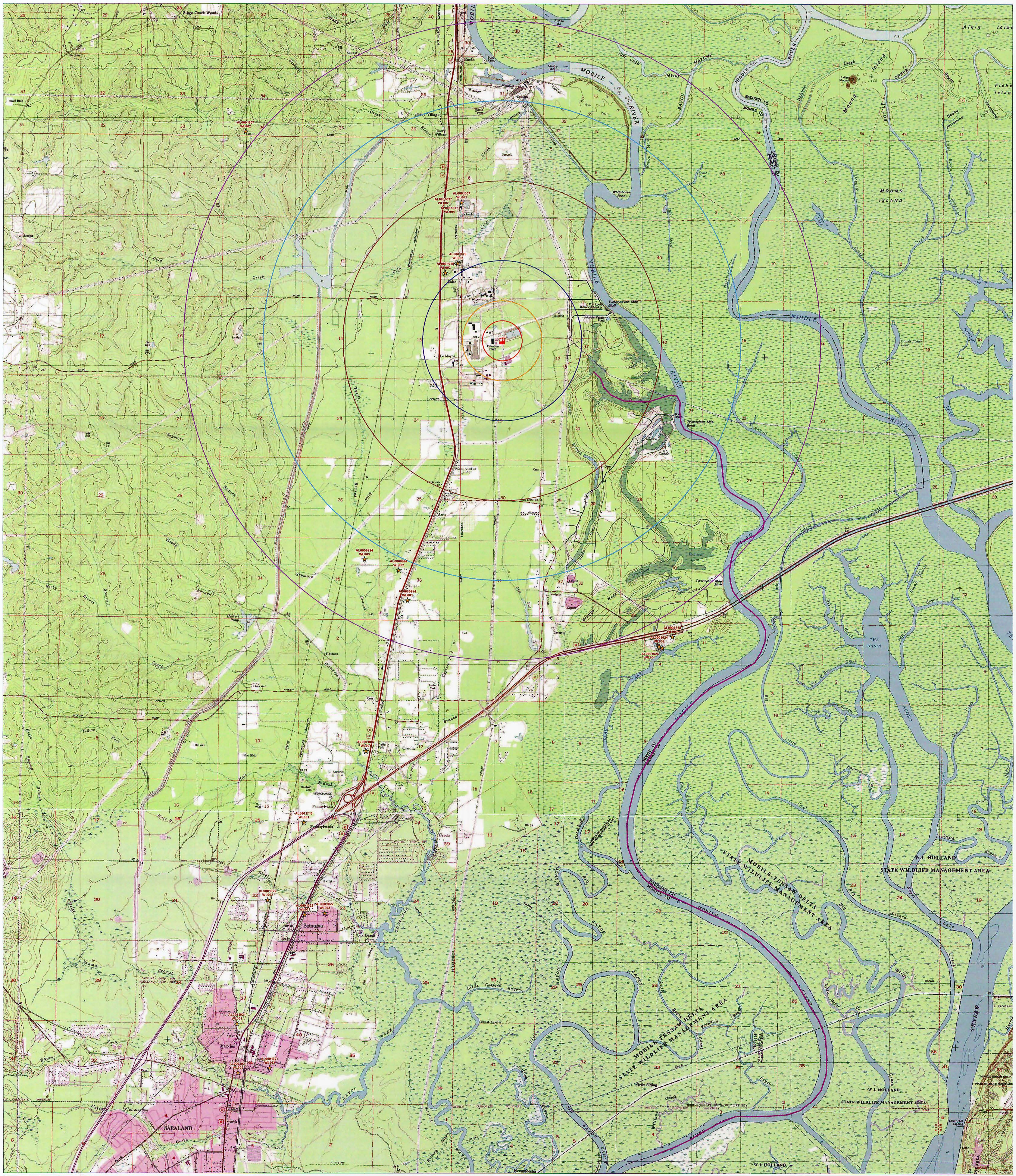
Although the options within Google Earth are endless, here are a few things you can do:

- *Discover the Earth*: Fly to any location in the world, learn about a city and it's geographic features, find local businesses, and create tours.
- *Explore the Sky*: Enjoy the wonders of the heavens and learn about our solar system.
- *Dive in the Ocean*: Go beneath the surface and visit the depths of the ocean and explore the planet's deepest underwater canyons. Learn about ocean observations, climate change, and endangered species. You can even discover new places to surf, dive and fish.
- *Walk on the Moon*: Take tours of landing sites narrated by Apollo astronauts and view 3D models of landed spacecraft.
- *Visit Mars*: Travel the Red Planet and explore NASA's latest imagery of our galactic neighbor.

Google Earth is simply your ticket to explore the Universe! Now, learn how to get started!

Already have Google Earth? Learn how to use Google Earth through the User Guide.

ATTACHMENT 1



Legend

🟥	Courtaulds Fibers Site
—	15 Mile SWPW

PopRings

▭	1/4 Mile
▭	1/2 Mile
▭	1 Mile
▭	2 Miles
▭	3 Miles
▭	4 Miles

Public Water

Water Source Typle

☒	Intake
✳	Spring
★	Well

SUM_TotPop	RINGLABEL
0	1/4 Mile
0	1/2 Mile
8.266327	1 Mile
275.558751	2 Mile
842.979303	3 Mile
662.65368	4 Mile

Courtaulds Fibers Site

NAME	Lat	Lon
Courtaulds Fibers, Inc.	30.961111	-88.013889

0 2,000 4,000 6,000 8,000 Feet

QUADSHEET
Chickasaw
Creola
Hurricane
Mount Vernon
Stiggins Lake
The Basin

N
W E
S

Geo-rectified USGS 1:24,000 Quads
Author: Lynn Ford Date: 2/15/2012
Date Saved: 2/15/2012 1:41:45 PM
Name: Courtaulds FibersProj
Coordinate System: NAD 1983 UTM Zone 16N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter
2000 US Census Data from Summary 1 File

ATTACHMENT 2

From: Collins, Crystal
Sent: Tuesday, September 25, 2012 10:19 AM
To: Hendrix, Dylan
Subject: RE: Courtaulds Fibers

Dylan,
The fence covers the perimeter of the property. They have a 24 hour guard on duty at the entrance of the property.

Crystal L Collins
Environmental Scientist, Senior
Redevelopment Section
Environmental Services Branch
Phone 334-279-3076

From: Hendrix, Dylan
Sent: Tuesday, September 25, 2012 10:12 AM
To: Collins, Crystal
Subject: Courtaulds Fibers

Crystal,
I have been looking through the O&M Report and the Covenant, but found no mention of any fencing at the site. My 1993 SI indicated that there was a fence surrounding a majority of the property, enclosing the manufacturing building, office, and waste areas. During your last inspection, did you observe a fence surrounding these areas or around the perimeter of the property?

Dylan C. Hendrix
ADEM
Land Division
Assessment Section
phone: (334) 271-7987
email: dhendrix@adem.state.al.us